



FRIDAY, JANUARY 15, 1904.

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Contributions

The Manhattan Bridge Design.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The allegations in the letter of Mr. R. S. Buck, referring to a previous statement of his, that I had intended to use my wire links for the Manhattan Bridge, which I have repeatedly denied, are such that I cannot let them pass unnoticed. By this time, readers of your journal may have formed an opinion without my comment as to the value of most of Mr. Buck's criticisms, but when as a proof of one of his repeated accusations, he quotes entries in his diary, the question is suggested whether those entries are any better proof than his assertions.

Mr. Buck alleges from his diary Jan. 4, 1902: "Discussed bridges No. 3 and No. 4 with Commissioner, who expressed anxiety to have his link cable scheme adopted. I requested him to bring his plans, which he promised to do on Monday." And on March 20, 1902: "Had conference with Commissioner, La Chicotte being present, at which he instructed me to prepare plans for bridge No. 3 with wire links for cables."

The facts are, however, as follows: A few days after I assumed charge of the Department, and before any plans of bridges No. 3 and No. 4 had been laid before me, Mr. R. S. Buck requested my permission to have copies made for the Department of my plans for the Quebec Bridge, which he and Mr. Nichols had seen more than a year previously at my private office, where both had called and requested to see them. I gave that permission, the blue prints were made, and are now in the archives of the Department. The plans were discussed a few times, and why should they not be? They are good plans, worth having, and I should have published them long ago, like some other plans, had I been able to spare the time for a paper on them.

The cables in those plans consist of wire links. But whatever advantage wire links may have under certain conditions over the ordinary wire cables for suspension bridges, they have not the advantage of looking well, as they require a rather bulky envelope and housing. They were decidedly objectionable from an architectural point of view, and at no time did I consider them suitable for the Manhattan Bridge, in which it seemed to me that architectural considerations should have as much weight as the engineering ones. I have no recollection of having given and I did not give, on March 20, or any other date, directions to Mr. R. S. Buck, or to anyone else, to prepare plans for Manhattan Bridge with wire link cables. Moreover, had I given such directions, the office record would show it. There is no record that such plans were commenced or prepared.

As to eye-bars of nickel steel, Mr. Buck does not seem to know that Krupp in Germany had proposed them several years before in a German bridge competition, and

that they were no novelty when I looked into their availability for the Manhattan Bridge, as soon as the delays with the wire cables at the Williamsburgh Bridge made the question an acute one. That was after Mr. Buck had left May 1, 1902.

The attacks in certain newspapers on me personally, which Mr. Buck mentions, had commenced even before I had entered on my official duties, as I was informed later on; and have more or less been kept up ever since. About their source and purpose, I will admit Mr. Buck may know more than I do.

G. LINDENTHAL.

The Turning Moments of Four-Cylinder Balanced Compound Locomotives.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The *American Engineer and Railroad Journal* for December, 1903, contains an article by me entitled "Two Specially Important Features of Balanced Compound Locomotives," in the course of which the following absolutely indisputable statement appears: "With a locomotive having four cranks set at 90 degs. to each other,

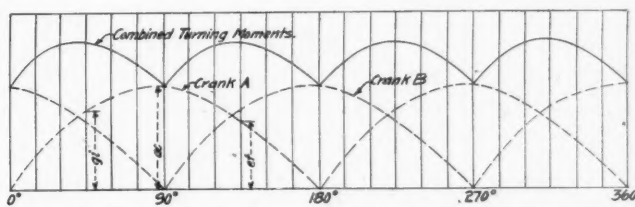
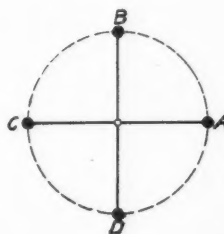
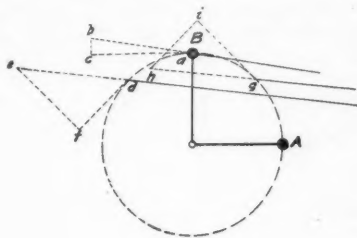


Fig. 1. Turning Moments of Ordinary Two Cylinder Locomotive.

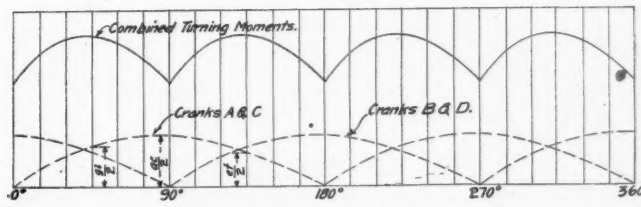


Fig. 2. Turning Moments of Four Cylinder Locomotive.

the turning moments are, obviously, much more uniform than in an ordinary engine, and practically approximate very closely to the results obtained from an electric motor drive."

Your issue of the 1st inst. contains an anonymous communication signed "Q. E. D.," in which the writer, after stating that "it seems well to point out a serious error in the article (mine), which concerns fundamental principles," commits himself as follows: "The cranks of a four-cylinder compound locomotive are not set 'at 90 deg. to each other' (his own diagrams show them so placed), and the tractive force developed during each revolution of the driving wheel is not more uniform in the four-cylinder balanced compound than in the ordinary two-cylinder engine." (The italics are mine.)

This latter assertion is equivalent to stating that the curve of combined torsion moments of a four-crank triple, or quadruple-expansion marine engine, is not more uniform than that of a compound engine; the obvious absurdity of which contention renders it unworthy of serious consideration.

As I take little interest in replying to anonymous critics of my technical writings, I shall simply direct "Q. E. D.'s" attention to an article entitled "Four-Cylinder Compound Locomotives," by M. Alfred G. de Glehn, Directeur-Generale de la Société Alsacienne de Constructions Mécaniques, published in *The Engineer* (London) of Oct. 30, 1903, in which the following statement occurs: "In electric motor-driven vehicles the adhesive weight is, as is well-known, better utilized than in ordinary two-crank engines, owing to the uniformity of the turning moments. In the engines that I am describing with the four cranks set at 90 deg. the turning moments are, of course, much more uniform than in ordinary engines, and approximate practically very closely to the results obtained by a motor drive." (The italics are mine.)

An editorial entitled "The Perfect Locomotive," in the same issue of *The Engineer*, will also prove most instructive to "Q. E. D." Both Mr. de Glehn and myself wrote for engineers who are familiar with the subject under discussion, hence it appeared unnecessary to labor arguments in support of such obvious and well understood facts as that the cranks of four-cylinder balanced compound locomotives are set at 90 degs. to each other (of course considering both sides of the engine), and that the mean rotative effort and tractive force developed during each revolution of the driving wheels is much more uniform in these locomotives than in ordinary two-crank engines.

In conclusion, I would call "Q. E. D.'s" attention to the important fact that he has made no comparison whatever between his curve of tractive effort of the Santa Fe balanced compound and that of a single-expansion, or two-crank compound locomotive, of equal power. I fancy that such a comparison, based upon actual indicator diagrams, which have been corrected for the inertia effects of the reciprocating masses of the respective engines, would prove a revelation to "Q. E. D.," and I therefore

suggest to him that he prepare such a series of comparative curves, and publish the same in a future issue of the *Railroad Gazette*.

EDWARD L. COSTER, Assoc. Am. Soc. M. E.

[Mr. Coster's communication was shown to "Q. E. D.," who prepared the following answer.—EDITOR.]

TO THE EDITOR OF THE RAILROAD GAZETTE:

I regret that Mr. Coster has not dealt with facts and proofs. Nothing in his communication tends to discredit the correctness of my diagrams published in your issue of Jan. 1. The method of obtaining the diagrams was explained in full so that every step could be followed. The results showed that the tractive effort of the four-cylinder balanced compounds on the Santa Fe when running at 30 miles an hour, varied from about 9,500 lbs. to 13,500 lbs., which surely does not approximate the "results obtained from an electric motor drive." In this particular case the variation of tractive effort from the mean value during one revolution of the driving wheels is about 17 per cent. In the Master Mechanics' proceedings for 1892 will be found a report of a committee on "Compound Locomotives." Among other things, the commit-

tee gives diagrams showing the variation of rotative effort for simple and compound locomotives. The diagrams were calculated from actual indicator cards. For a simple two-cylinder engine with 18 in. x 26 in. cylinders, the following variations in rotative pressures in per cent. were found.

18½ m.p.h.		28 m.p.h.		44½ m.p.h.	
Above mean.	Below mean.	Above mean.	Below mean.	Above mean.	Below mean.
5	6	15.9	22.2	33.3	43.3

At 28 miles an hour, the average maximum variation was 19 per cent.—or practically the same as that obtained by me for the Santa Fe compound running at 30 miles an hour.

In regard to my statement that the cranks of a four-cylinder balanced compound are not "set at 90 deg. to each other," Mr. Coster admits that my diagram is correct, as is also the description of the crank arrangements. My objection to the use of the term "set at 90 deg. to each other" is that it is ambiguous. Starting from one side of the engine and going across, the second crank (inside) is set at 180 deg. to the outside crank (first); the third crank (inside) is set at 90 deg. to the second (inside), and the fourth crank (outside) is set at 180 deg. to the third crank (inside). If the cranks were "at 90 deg. to each other," each succeeding crank would be set quartering with its preceding crank.

The diagrams, Figs. 1 and 2, show the theoretical turning moments of a two-cylinder and a four-cylinder balanced locomotive. The turning moment diagrams of cranks A and C of the four-cylinder engine are the same. The resultant diagrams (full lines) of both engines are the same. It is assumed, of course, that the power of both engines is the same and hence each of the cylinders of the four-cylinder engine develops half the tractive effort of one of the cylinders of the two-cylinder engine.

Inasmuch as reference to marine engines has been made, the following quotation from a paper by Naval Constructor D. W. Taylor, U. S. N., read before the Society of Naval Architects and Marine Engineers in 1901, may be "most instructive": "If a four-crank engine has four simple, double-acting cylinders, the 90 deg. spacing is equivalent, as regards turning moment, to two cranks at 90 deg. For the turning moment on a crank at 0 deg. in such an engine is the same as that on its opposite crank at 180 deg., and the two cranks at 90 deg. and 270 deg. are equivalent to one crank with double moment at either 90 deg. or 270 deg. To secure the most uniform turning moment for double-acting engines, the crank should be at or opposite the angles obtained by dividing 180 deg. not 360 deg., by four, the number of cranks. Thus, starting with the first crank at 0 deg., the second should be at 45 deg., or 225 deg.; the third at 90 deg., or 270 deg.; and the fourth at 135 deg., or 315 deg. This conclusion, obvious for four-crank simple engines, is readily shown to apply to quadruple engines, where about the same power is developed in each cylinder." Q. E. D.

The Development of Northern Maine.

Aroostook County, at the extreme northerly end of the State of Maine, is a county of large proportions, nearly as large as the State of Massachusetts. The area of the former is about 6,800 square miles; of the latter about 7,200. Until the opening of the Bangor & Aroostook to Houlton, the shire town of the county, in 1894, the means of transportation were meager. There is no navigable water for steam or sailing craft. The St. John River, taking its rise in western Maine, flows northward for nearly one hundred miles in the State, then forms for a considerable distance the boundary with Canada; after which it flows something like 200 miles easterly and southeasterly into the Bay of Fundy at St. John, N. B., some ninety miles east of the nearest Canadian touch with the State of Maine.

Three-fourths of a century ago northern Maine was rich in large white pine of good quality. The pioneer settlers of moment were lumber operators, who were attracted there by the pine. The process of cutting, hauling and floating the logs was a tedious one. Supplies for man and beast were not infrequently sent several hundred miles by steamer or sailing craft from United States points to St. John, N. B., there transferred to smaller craft and taken 70 miles up the St. John River, which, for that distance (to Fredericton, the capital of New Brunswick), is navigable for steamers of considerable size; then followed the task of dragging with horses what was called a "tow boat" one hundred or more miles, as far as that means of transportation was feasible, after which came the still sterner task of teaming the loads to and into the forests. Not infrequently it became necessary to store the supplies at the end of the "tow boat" ride until rivers, lakes and streams were frozen and a sufficient depth of snow had come for making woods roads. It may be remarked that for successful lumber operations in northern Maine a good depth of snow is essential, and may invariably be depended upon. Roads opened with it as a foundation ignore most stumps, rocks, depressions and elevations over which teaming at the ground level would be impossible.

Additional to the use of such roads for taking in supplies was their necessity for teaming logs to lakes, streams and rivers, the logs, from their landings, upon the first departure of the ice and upon the freshets caused by the melting snow, to be started on their long journey to Canadian tidewater.

Not too long logs could be cut, because of danger that if only one or two of them, in the first instance, caught in some falls it would form a "jam" and "hang up" the whole "drive."

Under an arrangement between the Governments of the United States and Canada, Maine lumber operators could, as they now can, build and own mills in Canada, manufacture in them, and reship the mill product back to "the States" duty free. Not only did this furnish employment for Canadian laborers at and about the mills and the port, but it also was an encouragement to Canadian machine shops, supply stores, etc. For log cutting Canadians were taken into the Maine woods by hundreds, to return to their homes when the season was over.

Not all of the large old-growth pine timber was secured, because of the long haul to floatable water. Much of it remains. With the advent of pulp and paper mills and the growing request for spruce, hemlock and cedar, operations for other than pine were encouraged, and now there is but little of any kind of northern Maine timber which is not in good and growing request, given means of transporting it economically, and with reasonable promptness, to and beyond well populated New England.

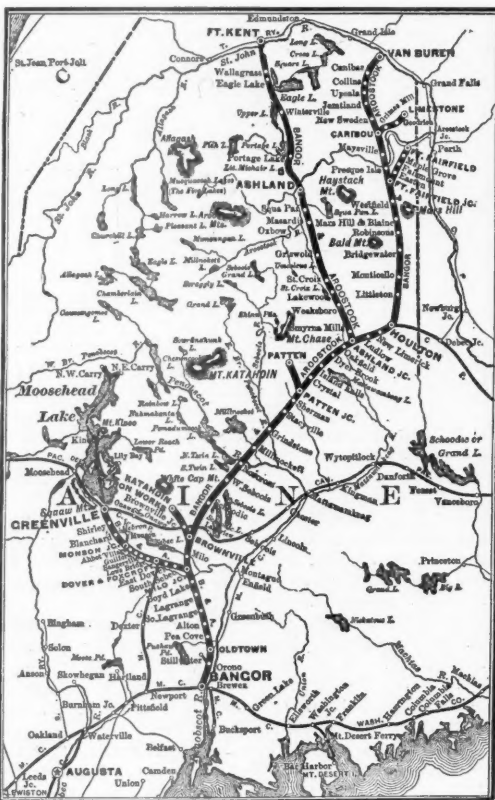
Out of a total area of about 4,400,000 acres in Aroostook County, not over 800,000 can as yet have been "taken up" by the towns, villages and farming settlers; probably less than 400,000 acres are cleared. Contiguous to Aroostook County are Piscataquis and Penobscot Counties, also rich in timber, the aggregate unimproved area being, probably, in excess of seven million acres, splendidly watered, rich in water-powers, storage basins for water as well as for logs, much of high land, even to mountains, the king of which is Katahdin, its summit being something over a mile above the sea level; streams, rivers and brooks abounding in trout and salmon and the forests with game from grouse up to deer by the tens of thousands at least and moose by the thousand.

Aroostook County had practically no population (less than 4,000) in 1830. This population discovered that the soil of the valleys and hardwood ridges was rich and that the yield per acre to potatoes and hay was large and of exceptionally good quality. Under governmental investigation it was learned that in many localities and over large areas there was, beside the rich surface loam, an underlying stratum of limestone, which is of particular value for potatoes. Some United States census report gives the average yield of potatoes per acre in the country at appreciably less than 100 bushels; in Maine about 110 bushels; in Aroostook County 160 bushels. By some process, presumably growing knowledge of the richness of the soil, the population had, in 1840, reached about 9,000. The growth in population continued without any but cumbersome means of transportation and with no railroad until, in 1890, it had reached 22,000.

Not long thereafter an eight-mile spur from the New Brunswick & Canada Railway, of which less than three miles were in Maine, was built into Houlton. The New Brunswick & Canada was one of the oldest roads on the continent. It was projected from St. Andrews, N. B., at the head of Passamaquoddy Bay, to Quebec. After all

manner of vicissitudes, and many occasions, extending over long periods, for "hanging up," it was completed, or rather some light, old-fashioned rails were laid, to a point near Woodstock, N. B., about 90 miles, and not far from the border. At the time of the extension into Houlton the track was about as bad as it could be, about one-half dozen old and light engines and eight or ten small box cars constituted the equipment adapted to Aroostook County's needs. The route to and from the markets which the county was invited to, and did use, was rail to St. Andrews (\$50 per carload net over 20,000 lbs., whatever less weight there might be), sail to and from St. Andrews, or small steamer to and from Eastport, thence larger side-wheel steamers to and from Portland and Boston. As our currency, through the Civil War, depreciated, the Canadian Railway Co. consistently demanded and obtained gold or its equivalent. Aroostook potato yield had begun to give stock to spare. Some small starch factories were established. As late as 1870 it was costing \$20 per ton or more to transport the products of the factories to the nearest market.

In 1868-9 and '70 what was known as the European & North American Railway was built eastward from Bangor, Maine, to Carleton (St. John, N. B.), and almost simultaneously the European & North American Railway in New Brunswick, east of St. John, was connected with the Nova Scotia Railway, Halifax, N. S., westward (the two making about 280 miles). Prospectuses announced that the inspiration for this was an intention of supplanting direct ocean steamers Boston, New York, etc., across the Atlantic, in favor of making Halifax the termini for



Bangor & Aroostook Railroad.

steamers and rail. The result was never reached. The European & North American east of St. John is a part of the Intercolonial (Canadian Government) System; Bangor to the boundary a part of the Maine Central; the boundary to St. John a part of the Canadian Pacific.

The construction of the road was of benefit to Aroostook County. The location was across the New Brunswick Railway, six miles east of the border and 48 miles south of Houlton. A means, as circuitous and crude as it was, was opened for all-rail shipments to the markets. The New Brunswick & Canada management could see no reason for encouraging all-rail traffic, and for a long time it stood upon the argument that it controlled all business, that there were only about 40,000 bushels potatoes per year to go out, and that shippers must pay what it was seen fit to charge. For a full year the argument that "hundreds of thousands of bushels may go out at encouraging rates" had slight effect. It was not until 1872 that an all-rail tariff was consented to. The rate for potatoes to Boston under it was over 30 cents per bushel (412 miles), or over \$100 for the then carload of 350 bushels. It was not until some years later that this was reduced to 25 cents per bushel. It is now 10 cents.

Not many years after the rail connection, as mentioned, was made, the Canadian Government subsidized a narrow-gauge road from opposite Fredericton, N. B., to follow the St. John River northwesterly, in Canada, 168 miles, to Edmundston, N. B. It was built. The little communities in north Aroostook, from 45 to 60 miles north of Houlton, were quick to see an opportunity for touch with a railroad. By degrees a 30-odd mile spur was encouraged to Fort Fairfield, Caribou and Presque Isle, respectively, following the Aroostook River. The patrons at Presque Isle especially, the ultimate terminus, were obliged to ride, or ship, in a half circle around through Can-

ada, some 85 miles out of direct route, to reach the markets; but the richness of timber and soil resources enabled them to do this, and to grow. We find the population in 1880 about 42,000, in 1890 about 50,000, and in 1892 we find the resources and the resolution of the business men strong enough to offer a half million dollars to any company which would furnish them with a direct line of railroad wholly on United States soil.

So much of a recital, condensed as much as it properly can be and with many salient facts omitted, is necessary to an understanding of what led, in the distressingly depressing years financially, 1893 to 1898, to the construction of the Bangor & Aroostook.

The company at first leased and has since purchased the Bangor & Piscataquis R. R., from junction with the Maine Central at Oldtown to Greenville, foot of Moosehead Lake, with spur Milo Junction to Katahdin Iron Works. In 1893 it built 94 miles, from Brownville to Houlton; in 1894 northward from there 60 miles to Caribou, with spur 14 miles to Fort Fairfield; in 1895 Ashland Junction to Ashland, 43 miles; in 1897, Caribou to Limestone, 15 miles; in 1900, Caribou to Van Buren, 33 miles; and in December, 1902, laid the last of the rails in extension of the Ashland spur to Fort Kent, 51 miles; thus opening by main line, via Houlton, most of the developed agricultural section with much timber territory collateral, and a distinct timberland spur, 93 miles, Ashland Junction to Fort Kent, with some, and rapidly developing agriculture collateral. It was only in the summer of 1903 that ballasting on the last of the new road was completed, or that the trunks were provided from which added construction by spurs could, as they now can be, readily added as business enterprises may be promised to warrant; and it is to be seen that the development which it is expected will follow the present transportation openings will by far exceed all past development, as satisfactory and substantial as that has been.

The valuation of towns in Aroostook County on the line of the Bangor & Aroostook has increased since 1893 nearly or quite 70 per cent. That of Houlton has increased from about \$800,000 to nearly or quite two and one-half millions. The output of potatoes per year in the first six years after opening of the road north of Houlton averaged over twice that from all sources east of the boundary, by rail, in 1889. The crop of 1903 has supplied about 40 starch factories, and most of the seed for the present year for the population, now well up to 70,000. If cars can be supplied, it will furnish from six to eight million bushels for the table and for seed at points south of Maine. For seed the stock is in large and growing request in every State in the Union, the West Indies and Bermuda. The quantity of hay increases, but along with the increase the farmers appear to, wisely, be paying attention to stock raising. Oats are raised freely and of superlative quality; wheat is being given more and more attention. Several roller flour mills have been established, and rye, barley and buckwheat are successfully raised. No farmers are better prospered than in this long time called "Garden of New England;" none have better churches, schools, academies, banks and stores. There is practically no advantage enjoyed anywhere which those people do not enjoy. The lamentable feature out and about is that so little is understood of northern Maine's advantages industrially, and that so much misapprehension exists because of knowledge only of its rugged shores, or belief that present lack of population in the forest indicates non-promising railroad results. In a week a logging crew can build their own houses of logs, and, from axes, produce more tonnage per day than an entire shoe-making town, and the cases are numerous where they do it.

There is timber enough for all time; the growth is up to the railroad companies' capacity to move it. Machinery has been and is being rapidly installed. From not exceeding 4,000 carloads of lumber products in the early days of the road, not less than 40,000 carloads should offer this year. The good soil of Aroostook, and much in adjoining counties, is ample for many times the present farming.

The earnings of the Bangor & Aroostook have come on steadily during the prolonged depression, when those of most roads were unsatisfactory, even with construction not complete, and surprisingly when the depression was over. They will continue to grow. It is a question whether financial troubles in the large centers do not invite many a man attracted there to "make his fortune" to return to the, in every sense healthier, old home.

Statistics of earnings, etc., follow:

	Years Ending June 30.			
	Miles.	Gross.	Expense.	Net.
1893.....	95	\$184,597.29	\$117,874.11	\$74,600.24
1894 average...	142	246,384.13	188,605.39	71,876.18
1895 average...	226	582,832.12	383,199.97	199,632.15
1896 average...	270	699,661.50	443,180.88	256,480.62
1897 average...	292	754,780.66	463,217.09	291,563.57
1898 average...	310	779,206.76	454,817.94	324,388.82
1899 average...	338	929,253.56	573,161.33	356,092.23
1900 average...	355	1,230,422.99	742,338.12	488,084.87
1901 average...	361	1,449,454.48	908,422.37	541,032.11
1902 average...	361	1,708,936.39	1,101,884.25	607,052.74
1903 average...	388	1,800,168.39	1,130,559.43	669,608.96
Equipment.				
Engines		15		61
Passenger train cars.....		15		58
Freight cars		462		3,184
Service cars		5		42
Passengers carried		194,574		481,310
Tons freight carried.....		257,609		946,405
Train miles		699,754		1,124,550
Earnings per mile of road.....		\$2,137.97		\$4,487.74

Interurban Trolley Roads in Indiana.

(Continued from page 22.)

The physical characteristics of the country in the central part of Indiana are peculiarly advantageous for the building of high grade interurban electric roads at a low first cost per mile. None of the roads leading out of Indianapolis has encountered any serious natural obstacles, ranges of hills, large streams to be crossed or deep rock cuts to be made. Most of the towns being situated on the lines of existing steam roads, when the location of a proposed electric road was to be determined, the choice usually fell on a line practically parallel to the steam road as being the most direct and feasible route, and the electric roads have usually purchased a right-of-way within less than half a mile from the steam road; often the adjoining strip of land to one side. With the single cars or trains of cars, independently propelled, the ruling grades and curves can with economy be made much heavier with a consequent reduction in cost of con-

comes a habit and a necessity, from which the transportation company profits. A noticeable feature of the traffic on these roads, however, is the small proportion of passengers taken on or let off between towns even on the lines having the most frequent stops. For the strictly local trains making all stops, the convenience of the accommodation, even to the few, more than offsets in the good-will gained, the cost of making frequent stops, but for a large proportion of the passengers the service offered by such so-called limited trains as are run on the Indianapolis-Kokomo division of the Union Traction Co., which make one stop in each town along the line, is the most satisfactory both for time and comfort of the journey. The people living within a half a mile or so on each side of the line are the only ones who really avail themselves of the intermediate stops. Where it is necessary to go farther than that to reach the line, it is more convenient for the farmers to drive a longer distance to a town and stable their horses if they are going any further on the cars.

too close a margin between earnings and expenses. There will shortly be put in service between Indianapolis and Columbus, Ohio, by way of Richmond and Dayton, a through parlor and sleeping car service with a special design of car of the Holland Palace Car Co. These cars, which were described in the *Railroad Gazette*, Aug. 14, 1903, p. 583, are now built and will be placed in service as soon as certain slight changes can be made in the clearance limits of the lines over which they will run. The accompanying illustrations of the exterior and interior show the handsome appearance and large size of these cars, which are in every way equal to the Pullman cars in service on the steam roads.

The freight and package express business which the interurban companies do is a source of much convenience to the people in the outlying districts, although there is some doubt as to its ultimate profit to the company. The situation may be summed up briefly in one statement. So long as the freight and express business does not exceed a certain amount, beyond which passenger

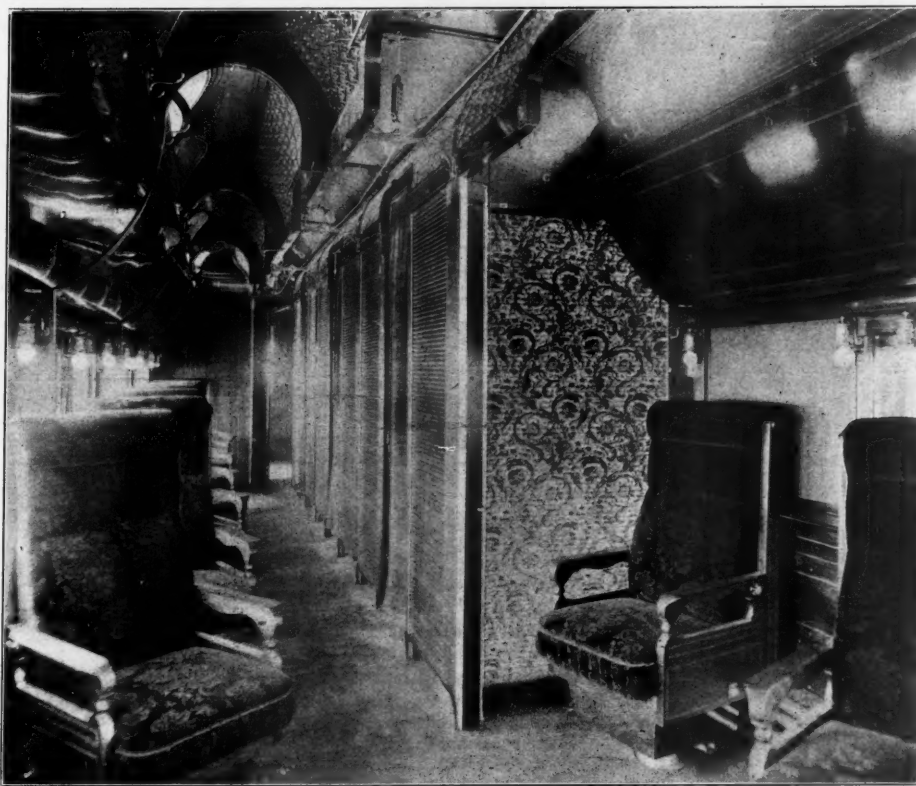


Exterior of Holland Sleeping Car for Electric Interurban Railroads.

struction of the line. No expensive right-of-way has to be secured in the cities and towns along the route, the use of the streets being donated or secured at a nominal yearly rental. With the additional cost of over-head construction and power house equipment on one side, the electric roads have on the other side, practically no expense for freight and passenger terminals, large amounts of rolling stock and motive power equipment, and numerous other items included in the first cost of building a steam road. The track construction, bridges and other permanent structures on a modern high speed road compare favorably with the steam roads, with the exception, of course, of heavier grades and sharper curves, although on most of the proposed lines it is planned to have nothing heavier than 1 or 1½ per cent, grades and 3 deg. curves outside of the cities. It is for these reasons, primarily, that the interurban roads show such satisfactory returns on the investment, from the beginning of operation.

The promoters of interurban roads in Indiana have been met with a spirit of fairness and friendliness on the part of the farmers along the proposed routes and by the town and county governments. Throughout the West there is an underlying sentiment against the railroads, and the people, particularly in the rural districts, are not slow to retaliate, if they can, against the railroads, because of real or fancied grievances. Public bounties have, as a rule, not been asked for to assist in building the interurban roads but every privilege has been granted in the way of rights on public highways, track rights in the towns and through private property. One of the best inducements which the electric roads have offered in return for acquiring a right-of-way, is to establish a stopping point at or close by the owner's house, and wherever practicable, this has been done, to the great satisfaction of the farmers. On most of the lines these stops are located about every half mile, usually at a cross road.

On opening an interurban road for traffic, the service which it is possible to offer attracts business from the start. Not the least factor in developing business is the novelty of getting on a car at one's door and for a very reasonable cost, going into town to transact business. Persons living four or five miles out, go in twice or three times as often on the electric line as when compelled to drive or walk; and what is at first a fad be-



Interior of Holland Sleeping Car, Showing Three Sections Made Up.

On the long lines, 50 miles or more, there is as yet only a small proportion of travel between termini, except where a limited service is given, such as between Indianapolis and Muncie, 56.6 miles, with four limited trains a day each way, making the run in two hours with only one stop at Anderson. These trains are usually crowded. They are run in addition to the regular hourly local service and make direct connections at Anderson with cars for other points on the same company's lines through the gas belt.

The passenger rates on the electric roads in this section of the country are almost uniformly 1½ cents a mile whether a ticket is purchased before boarding the cars or a cash fare paid on the car. Round trip tickets are sold on most of the lines at a slight reduction; on the Union Traction Co., the rate is 1¼ times the single trip fare. Fifty trip and special party tickets are also sold, but so far no mileage books have been issued on any of the Indiana lines. On certain portions of the Union Traction Co.'s lines the fare was for a time only a cent a mile, but this has been increased to 1½ cents within the last two months, as it was found to produce

traffic suffers from the congestion of the line, it is not a source of loss and the profits depend largely on the rates and volume of business handled. It has yet to be proved that electric traction is more economical for large quantities of bulk freight, than hauling with steam locomotives. The interurban roads are primarily passenger roads and the carrying of freight at a small profit at the expense of a paying passenger business is short sighted expansion. Steam roads with a large volume of freight business, in attempting to compete with the electric roads for local passenger business, must take a small profit on the passenger business and suffer a heavy loss on freight business due to delays and congestion of traffic caused by overtaxing the capacity of the line with a large number of local passenger trains which to render satisfactory service must have precedence over freight trains. It is an attractive field for the electric roads to enter, however, and they have built up a large business in and around Indianapolis since the service was inaugurated. All of the roads do more or less business, but the Union Traction Co. does about 50 per cent. of the whole. The total gross receipts for all the lines amount to about \$14,000 a month, and the commercial value of the shipments out of the city is probably over \$5,000,000 a year. The city authorities have been very lax in enforcing the terms of the contract between the interurban companies and the city and none of the lines make any attempt to handle their business according to the regulations nominally imposed. Two of the companies which have been in operation more than three years are still loading and unloading their cars from "dead" tracks, and it is not an uncommon occurrence for cars to stand in the streets for a whole day awaiting the convenience of the shipper. Such a condition of affairs is unsatisfactory to the shipper and the carrier alike, since the business has assumed such large proportions and steps are being taken to provide ample freight house accommodations by most of the lines. One proposition is to provide two union freight depots for use by all the lines, one in the eastern part of the city and one in the western part.

The electric roads have about maintained the rates of the steam roads on package freight, but classifications are not so strict and on the average the rates are a trifle lower. The chief reason, however, for the rapid growth of the freight business, as with the passenger business,

is the frequent and rapid service offered. The Union Traction Co. receives consignments up to 12 o'clock noon for delivery to all points between Indianapolis and Muncie the same day, and up to 8 p.m. for all points on the company's lines as far north as Marion to be delivered by 6 a.m. the following morning. Trains of from two to four express cars, a motor and trailers, leave during the early morning hours over this company's line, often with car load consignments of merchandise for intermediate towns. The trail cars have a capacity of about 20,000 lbs. and are built along the lines of the passenger cars, being mounted on the same class of trucks and equipped with air-brakes. None of the roads are using standard box cars. These trains have a clear line during the night and do not interfere with the passenger traffic in any way. The shipments into the city are largely produce and arrive on the morning trains. There are several good milk routes, among them the line to Greenwood, which brings in 200 cans of milk each morning, arriving about 9 o'clock. The rates on milk shipments are from 1 to 1½ cents a gallon, depending on the distance shipped. The imports are only about 30 per cent. of the exports from the city, which gives some idea of the benefits derived by the local merchants and wholesalers in being able to promptly supply orders from surrounding towns.

All of the interurban roads in Indiana that are now in operation are on a fairly sound financial basis and are earning amounts commensurate with the investments made. The issues of stocks and bonds are not excessive and no difficulty has been experienced in meeting all fixed charges and leaving a substantial surplus to be applied to dividends and sinking fund. The net earnings run from 40 to 55 per cent. of the gross earnings in most cases, and this leaves a reasonable margin of profit. Experience has shown that the business of a road in this territory increases about 25 per cent. during the second year of operation and often an equal gain is shown for the third year over the second. As an example of the extraordinary growth of the passenger traffic during only a short period of time, the following table showing the operations of the Indianapolis & Martinsville road for the first four months the road was opened, is of interest.

	Gross receipts.	Passengers carried.	Avg. fare per passenger. Cents.
1903—May	\$9,030.50	39,971	22½
June	8,864.80*	38,940	22½
July	11,513.21	49,570	23 1/5
August	14,186.44	57,924	23 1/6
Four months.....	\$43,594.75	186,405	23.13

*The first 15 days of June were abnormally cold and wet.

During these four months the operating expenses of the road were 45 per cent. of the gross earnings. For the year, net earnings will probably be more than \$60,000, against which are bond charges of \$37,500. Either a very abnormal increase in operating expenses or de-

Just what the policy of the roads will be in the matter of providing for renewals at fixed intervals depends largely on their prosperity during the next few years. There is every reason to be optimistic in estimating the future earning power of these roads, if the estimates be based on the very large increase in gross earnings over the first year's receipts, during the second and succeeding years. A reasonably conservative husbanding of surplus profits will without doubt provide sufficient funds to meet the necessary expenditures for improvements and renewals when the proper time comes without resorting to a further increase in the bonded indebtedness of the road and increasing the burden of interest charges. It is a problem for the future but one not to be entirely disregarded in considering the value of interurban properties and their prospects.

When the railroads in Indiana first began to feel the effects of the competition of the electric roads the usual methods of rate cutting and increased train service were put into practice on some of the steam roads and the fight waged with vigor for a short time. Usually, however, the railroads found the business getting away from them despite the inducements which they offered, and in most cases the active competition ceased within six months, with the electric roads doing nearly all the local passenger business. The Big Four, shortly after the Union Traction Co.'s line from Indianapolis to Muncie was opened, put on five extra local trains each way be-

ments of the steam roads themselves cannot give any exact information on the subject but they agree that such is the case.

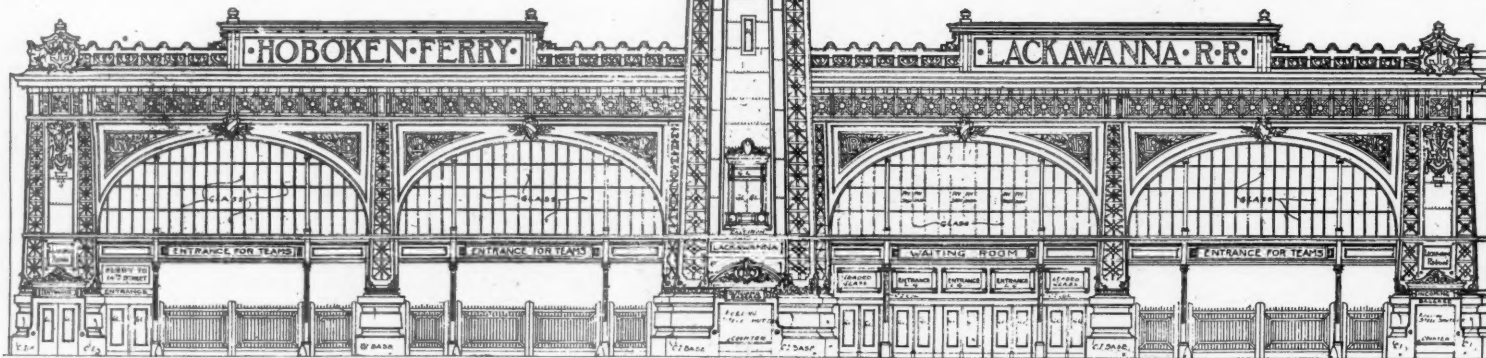
In attempting to forecast to some degree the future of the interurban roads in this territory, the same reasoning holds as for groups of roads in and about other centers throughout the country. The greatest menace to the electric roads is over competition and development. The temptation is strong to argue that because an existing road is earning large profits, a competing road in the same immediate territory can be put in operation and share the profits. So far the distribution of territory in the vicinity of Indianapolis has been fairly equitable and the 11 roads now in operation or soon to be opened do not compete strongly with each other at any point. It would seem, however, that the field is as well covered now as present business and future prospects would fairly warrant, and that the building of other roads would result in a competition, unprofitable to either side.

The consolidation of individual electric lines into large systems has already been begun in Indiana, and the spirit of community of interests is strong among all the independent lines. The Indiana Union Traction Co. now controls the entire system of the Union Traction Co. and the Indianapolis Northern, and is understood to be heavily interested in the Indianapolis Traction & Terminal Co. Similarly, the Indianapolis & Cincinnati owns the Indianapolis, Shelbyville & Southeastern, a possible competitor for the Cincinnati business. The plan for a terminal station for the joint use of all the roads in Indianapolis is an example of the community of interests which is sure to prove of benefit to all the roads.

The whole situation may be summed by saying that the history of steam railroad development is repeating itself in the case of electric interurban railroads here and elsewhere. The same difficulties will be met, the same reverses and reorganizations will be gone through as those which are familiar to the students of the history of steam railroads in the United States. What the ultimate end will be, is, of course, largely conjecture. Perhaps the most plausible guess would be that the existing steam roads will continue to be operated by steam but used exclusively as channels for the enormous bulk freight traffic which is taxing their capacity to the utmost even now, and that the reconstructed and improved electric roads will be used to handle the passenger traffic.

New Lackawanna Ferry House at Twenty-Third Street, New York.

The new ferry house of the Delaware, Lackawanna & Western Railroad at the foot of West 23rd street in New York, is to be the central building of a group of three ferry houses which are to be built for the Erie, Delaware, Lackawanna & Western, and Central of New Jersey Railroads respectively. This group will occupy a space of two blocks extending along the river front and



West Street Elevation of Lackawanna Ferry House at Twenty-Third Street, New York City.

crease in gross earnings would have to take place before there would be any trouble in meeting the payments on bonds. This road, which parallels the Vincennes division of the Pennsylvania Lines, is now doing 15 per cent. more business than the steam road ever did, showing that it has not only taken away practically all of the existing traffic but has built up an entirely new business equal to about 20 per cent. of the traffic which existed before the line was opened.

Nearly all of the roads have made some provision for a sinking fund to retire the first mortgage bonds at the time of maturity, but so far but few if any of them have made any provision for meeting in the future the heavy expenditures for renewals and maintenance which as yet have not made themselves felt in the income account. None of the roads in this section of the country has yet been in operation long enough to wear out the rolling stock or track to an extent requiring heavy repairs or complete renewal, nor will this condition of affairs be reached for probably eight or ten years. Most of the extraordinary expenditures made since the beginning of the interurban roads have been for extensions and improvements which may rightly be charged to cost of construction and on which it is a perfectly sound policy to issue bonds covered with a mortgage. If, however, it becomes necessary to issue second mortgage bonds to cover renewals, before the maturity of the first mortgage bonds, the second issue becomes of little intrinsic value as being secured by property which does not exist, having been used up in earning the interest on the first issue.

tween those two points and sold round trip tickets for the one way fare. Three of these trains were taken off within 60 days, although the reduced round trip rate is still in effect. Similar examples might be quoted concerning nearly all of the roads which have been paralleled by electric lines. As a whole the attitude of the steam roads has been tolerant and unobstructive. In only a few cases have attempts been made to embarrass or hinder the electric roads by refusing to enter into negotiations to settle the question of grade crossings or overhead structures. There has been no effort made, however, to enter into any traffic agreements or to form close alliances in any way. Switching facilities to power houses of electric roads have been offered without discrimination, and it can fairly be said that in every way the electric roads have received only the fairest treatment at the hands of the competing steam roads.

As has been pointed out before, the electric roads open up and develop the country which they traverse in a way not possible with the steam roads and on the long haul business, both freight and passenger, which results from such development, the steam road derives its greatest benefits. The trolley lines educate the people to travel and a through passenger business is developed which is profitable to the steam roads. It is exceedingly difficult to compile statistics which would show the amount of such long haul business directly attributed to the influence of the interurban roads because of the innumerable other causes which directly and indirectly affect the volume of business. The officers of the passenger depart-

West street between 23rd and 22nd streets, and will be as nearly harmonious in its general proportions as is possible. The Erie will replace its present ferry house with a new building at the north of the group. The Central of New Jersey has purchased land at the south of the group and will build at almost right angles to the two other ferry houses. Plans for these two buildings have not yet been fully developed, but work has already commenced on the Lackawanna structure.

The Lackawanna ferry house will be built with a steel framework sheathed on the outside with ornamental sheet copper, and no masonry will be used in the walls. The roof will be of slag, with interior finish of light wood. The building will have a frontage on West street of 225 ft., and a water frontage of 270 ft. The maximum depth will be 227 ft., and the minimum depth 198 ft. There will be three ferry slips, the south one of which will be used exclusively for boats going to 14th street, Hoboken. Unlike the slips in the Pennsylvania ferry house, there will be no "hood," but the boats will run directly into the building for a distance of 27 ft., thus affording better protection to the passengers in stormy weather. There will be the two bridges suspended by chains to transfer passengers from the upper decks of the boats directly to the ferry house.

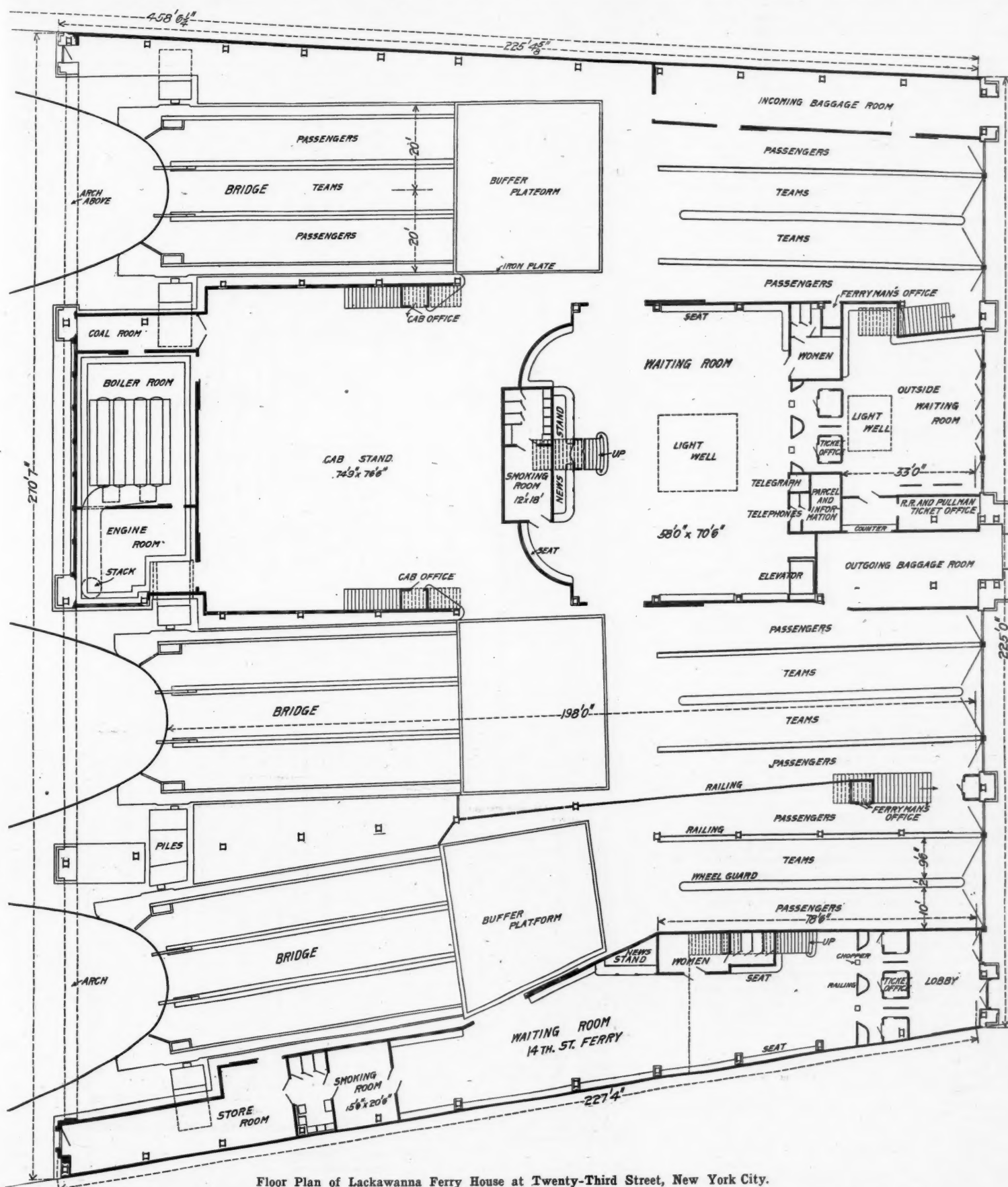
The accompanying plans show the general arrangement of the building. Allowance has been made for a large cab stand in the center of the ferry house, and for toilet rooms, baggage rooms and a commodious waiting room. There will also be a separate waiting room for passen-

ers going over the 14th street ferry. A large engineer's room is to be placed between the first and third buffer platforms, and from there the heating and lighting of the entire building will be directed. The front of the ferry house will be composed of four arches surmounted by plate glass. Three of these arches form entrances to the ferry slips for teams and carriages, but the one just north of the center of the building leads to the general waiting room. In the middle of the building is a tower 135 ft. high, bearing a clock dial, and over the arches on either side of this tower are illuminated electric signs

Foreign Railroad Notes.

We are modest in chronicling the feats of train robbers in Russia; but in one point that country need fear no comparison. On the night of August 24 the freight station in the considerable city of Vladikaukaz was seized by a band of robbers. Part of them devoted themselves to looting what valuables they could find, while the remainder kept up a constant fusillade out of the windows, which scared everybody away. Not till after they had left with their booty did a troop of Cossacks come on the

were made on workmen's tickets for which only \$1,130,881 were paid—an average of a little less than 2.4 cents per journey, the average length of which was 10.7 miles. The scholars' journeys cost on the average 2.68 cents each and they averaged but $8\frac{1}{4}$ miles. The journeys on these tickets were four times as numerous as all the others, but of course much shorter on the average; and they yielded but little more than 40 per cent. of the total passenger earnings. The average fare for all passengers was 0.769 cent per mile. This very low average is, of course, largely due to the special school and workmen's fares.



bearing the name of the ferry and the name of the railroad.

An important feature of the whole group will be a large iron and glass shed 50 ft. wide and about 600 ft. long in front of the three buildings. The cars which come down 23rd street will pass around a loop and go through this shed, depositing their passengers at the doors of the ferry houses. The city proposes to buy the block in front of the group, and make an approach or esplanade. The cost of the three buildings is estimated at about \$850,000, and the work will be completed in about a year. We are indebted for our plans to Kenneth M. Murchison, Jr., who is the architect for the entire work.

ground. On this railroad formerly the pay car was sent out by itself; but the robbers seized it so often that latterly it is sent out only with a train, and that on Sundays. For these robbers, who have been such for generations, hiding in the fastnesses of the northern slope of the Caucasus, are a pious folk, and will not work on Sunday. They belong to tribes who have only within the last hundred years come under Russian jurisdiction, even nominally.

In Belgium for many years commutation tickets for workmen and children attending school have been issued at very low rates. In 1901 more than 47 million journeys

Whether the passenger traffic pays at these rates may be doubted, as the average earnings were a little less than 70 cents per passenger-train mile, while per freight-train mile they were \$1.64; and the expenses averaged 74 cents per mile for all trains.

The Austrian State Railroads use impregnated ties almost exclusively, but they do not do the work themselves, but let it to contractors, usually for five years at a time. Two great firms do most of the work, having not only fixed works but portable apparatus. The railroads have a testing establishment, where also experiments are made with new processes.

The Baldwin Locomotive Works' Apprenticeship System.

The apprenticeship system adopted by the Baldwin Locomotive Works on Jan. 1, 1901, has now been in operation for three years and the report just issued covering the results obtained during that time is an interesting one. The classification of apprentices is based on age and mental training at the time of signing the indenture. Apprentices of the first class include boys 17 years old, who have had a good common school education and who bind themselves by indentures (with the consent of a parent or guardian in each case) to serve for four years; to be regular at their work; to obey all orders given them by the foreman or others in authority; to recognize the supervision of the company over their conduct out of the shop as well as in it; and to attend such night schools during the first three years of their apprenticeship as will teach them, in the first year, elementary algebra and geometry; and in the remaining two years, the rudiments of mechanical drawing.

The second class indenture is similar to that of the first class, except that the apprentice must have had an advanced grammar school or high school training, including the mathematical courses usual in such schools. He must bind himself to serve for three years, and to attend night schools for the study of mechanical drawing, at least two years, unless he has already sufficiently acquired the art.

The third class indenture is in the form of an agreement made with persons 21 years old, or more, who are graduates of colleges, technical schools, or scientific institutions, having taken courses covering the higher mathematics and the natural sciences, and who desire to secure instruction in practical shop work.

The indentures or agreement in each case place upon the company the obligation to teach the apprentice his art thoroughly and to furnish him abundant opportunity to acquire a practical knowledge of mechanical work. The company is also bound to retain the apprentice in service until he has completed the term provided for in the indenture or agreement, provided his services and conduct are satisfactory. In all cases the company reserves the right to dismiss the apprentice for cause.

The rates of pay in the different classes are as follows:

	1st year.	2d year.	3d year.	4th year.
Apprentices of the first class...	5c.	7c.	9c.	11c.
Apprentices of the second class...	7c.	9c.	11c.	...
Apprentices of the third class	1st 6 mos. of 1st yr., 13c. per hr. 2d 6 mos. of 1st yr., 16c. per hr. 1st 6 mos. of 2d yr., 18c. per hr. 2d 6 mos. of 2d yr., 20c. per hr.			

In addition to the rates mentioned above, apprentices of the first class each receive an additional sum of \$125, and apprentices of the second class an additional sum of \$100, at the expiration of their full terms of apprenticeship respectively.

During the time which the system has been in operation there have been indentured 545 apprentices, divided into 352 of the first class, 124 of the second class, and 69 of the third class. Of this number, 153, or about 28 per cent., have been discharged for reasons other than the expiration of the terms of their apprenticeship.

The total number of apprentices carried on the rolls at the close of the year 1903 was 379. Of these 345 were machinists, five were blacksmiths, five were brass-finishers, 10 were moulders, 12 were pattern-makers, one was a boiler-maker, and one a sheet-iron worker. Of these, 232 were first class, 99 were second class, and 48 were third class apprentices. In addition to the indentured apprentices, there are 23 special apprentices, largely from foreign countries, namely, one from Finland, one from Costa Rica, two from San Domingo, five from Cuba, one from Spain, four from Japan, three from Porto Rico, and one from Mexico.

The number of apprentices indentured during 1903 was 165, of which 156 were indentured to the machinist's trade, six to the trade of pattern-making, one to brass finishing, one to moulding, and one to boiler-making. Of these 97 are first class, 40 second class, and 28 third class apprentices. Sixty-one apprentices have been discharged during the year, and 13 have completed their terms of apprenticeship.

The following statement gives the percentage of apprentices discharged from the inauguration of the system to the end of the year 1903:

During the first half year—Jan. 1 to June 30, 1901—	
Indentured, 66	
Discharged, ..	
During the second half year—July 1 to Dec. 31, 1901—	
Indentured, 163	
Discharged, 26	Percentage discharged, 15.9
During the third half year—Jan. 1 to June 30, 1902—	
Indentured, 259	
Discharged, 30	Percentage discharged, 11.6
During the fourth half year—July 1 to Dec. 31, 1902—	
Indentured, 324	
Discharged, 36	Percentage discharged, 11.1
During the fifth half year—Jan. 1 to June 30, 1903—	
Indentured, 364	
Discharged, 29	Percentage discharged, 8.0
During the sixth half year—July 1 to Dec. 31, 1903—	
Indentured, 424	
Discharged, 32	Percentage discharged, 7.5

Two apprentices of the first class completed their terms during 1903. Both are exceptionally good hands and at the expiration of their time were employed as machinists.

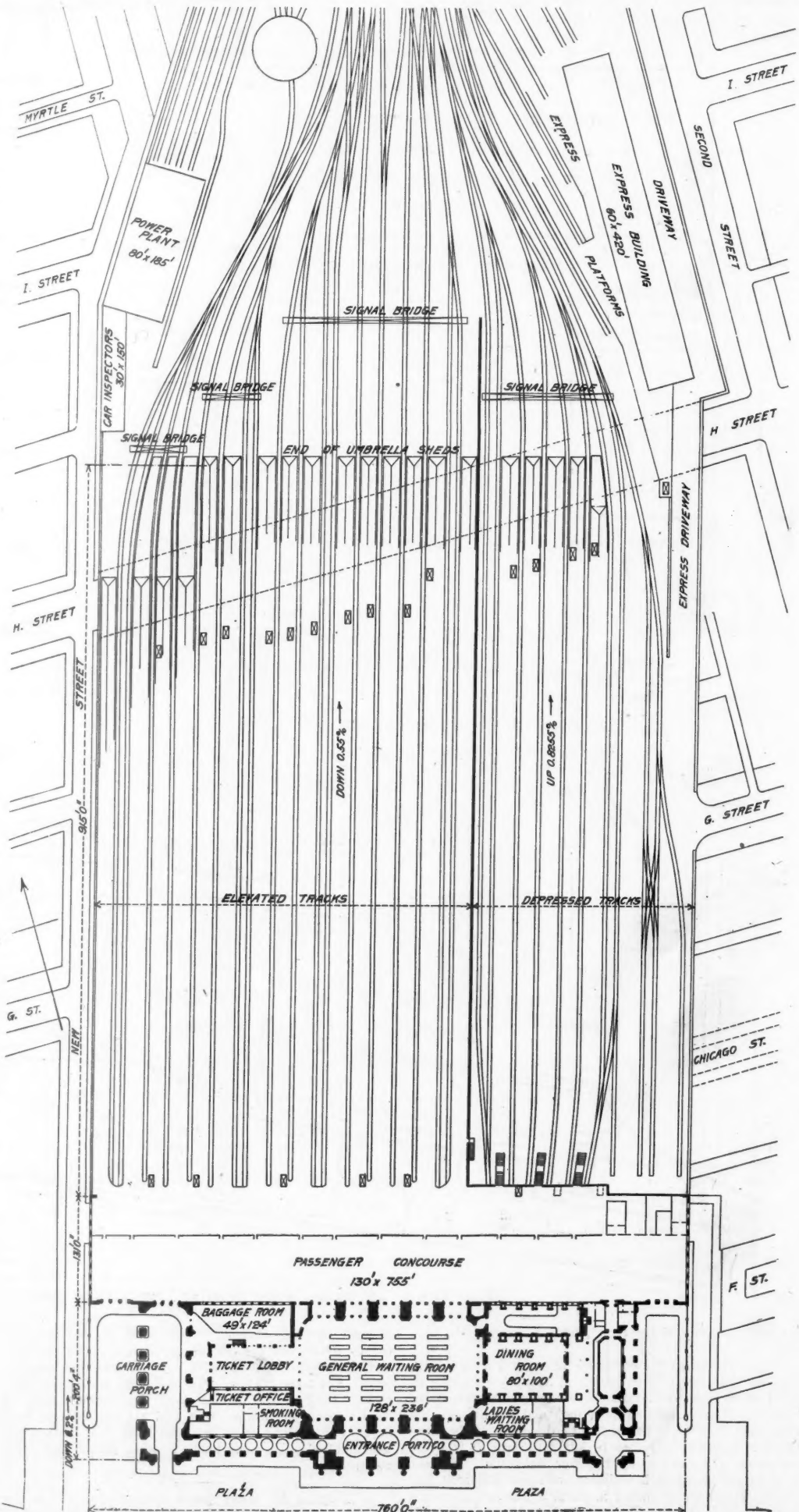
Eleven apprentices of the third class completed their terms during the year 1903, of whom six had been promoted to places of responsibility, and five employed as machinists. During the year 1904, 15 first class, 31 second class, and 19 third class apprentices will complete their terms of apprenticeship.

The attendance of apprentices at night school during the period from Jan. 5 to Feb. 25, 1903, was 63 per cent.; while at the commencement of the present school year, Oct. 19, 1903, there were enrolled at night school, 82 per cent. of all the first and second class apprentices.

During the year very few applications were received for employment as apprentices to the trades of blacksmith or boiler-maker, and such applications as have been received have been from those not of eligible age.

Nineteen Passengers Killed at Willard, Kansas.

On the morning of Wednesday, January 6, about half-past one, there was a disastrous butting collision on the Chicago, Rock Island & Pacific at Willard, Kan., in which 20 persons were killed and 30 or more injured, all of the killed being passengers. Westbound express train No. 3 and an eastbound stock train collided both running at good speed, and both engines and many cars were completely wrecked, but the fireman of the passenger train was the only man on either engine who was seriously injured, the others having jumped off in time to escape. The smoking car of the passenger train was nearly empty, but the car next behind it, the day coach, was completely crushed; and most of the victims



Proposed Plan at Street Level of Station and Train Sheds—Washington Union Station.

were in this car. The conductor and engineman of the passenger train had an order to wait at Willard for the stock train, but it appears that another freight train, standing on the side track at that station, was assumed by them to be the one specified in their order, and they went on without stopping. Conductor Nagle, of the passenger train, injured, and lying in a hospital at Topeka, said on January 8: "We (himself and Engineer Benjamin) had orders to wait for a special stock train at Valencia until 12.58, and to pass another stock train at Willard. We passed through Valencia at 1 a.m., and no stock train was in sight. At Willard we saw a stock train standing on the side track, and made no stop. I supposed the engineer thought that the two trains had been combined. I could not see the number of the engine on the side track on account of the steam, and because we were running so fast. We were going 50 miles an

hour." Engineer Benjamin was injured and no statement from him has been published.

Track Plans for the Washington Union Station.

The description of the proposed union station at Washington, D. C., together with the sketch of the building and plaza surrounding it and the floor plan of the station, which was published in the *Railroad Gazette*, December 4, 1903, dealt largely with the general plan of the improvement and gave in some detail the arrangement of accommodations for passengers in the main station building. We are now enabled to show the track plans drawn up for this great terminal, which of course are subject to change and probably will not represent the exact arrangement in the completed station. They are interesting, however,

simply as a study, inasmuch as the whole scheme differs radically from the accepted standards of terminal station arrangement and also because of the local conditions of grades and approaches which has affected the plans in a marked degree.

It will be remembered that the site selected is at the intersection of Massachusetts and Delaware avenues and that the station building will front south, looking down Delaware avenue toward the north wing of the Capitol. The Baltimore & Ohio tracks now occupy Delaware avenue from H street to Massachusetts avenue, and the new train sheds and station yard will occupy this B. & O. right of way and a strip of property on each side, giving a total width of about 800 ft. The floor of the concourse will be on a level with the plaza in front of the station, and on this account the entire station yard will be built on filled ground because of the dip of the surface north of the terminal. H and K streets are to be carried under the tracks at the station, as are all the other intersecting streets beyond to the city limits.

The present line of the Pennsylvania skirts the southern edge of the city along the east branch of the Potomac with a Y running north on Sixth street to the historic old station near Pennsylvania avenue. In order to have an entrance to the new terminal it will be necessary to build a tunnel starting from somewhere near the end of the existing short tunnel under Virginia avenue and continuing north and west under Capitol Hill, First street, N. E., the new plaza and into the station on a level about 16 ft. below the main concourse. This tunnel will pass under the hill between the Capitol and the Congressional Library and will have a maximum depth below the surface of about 56 ft.

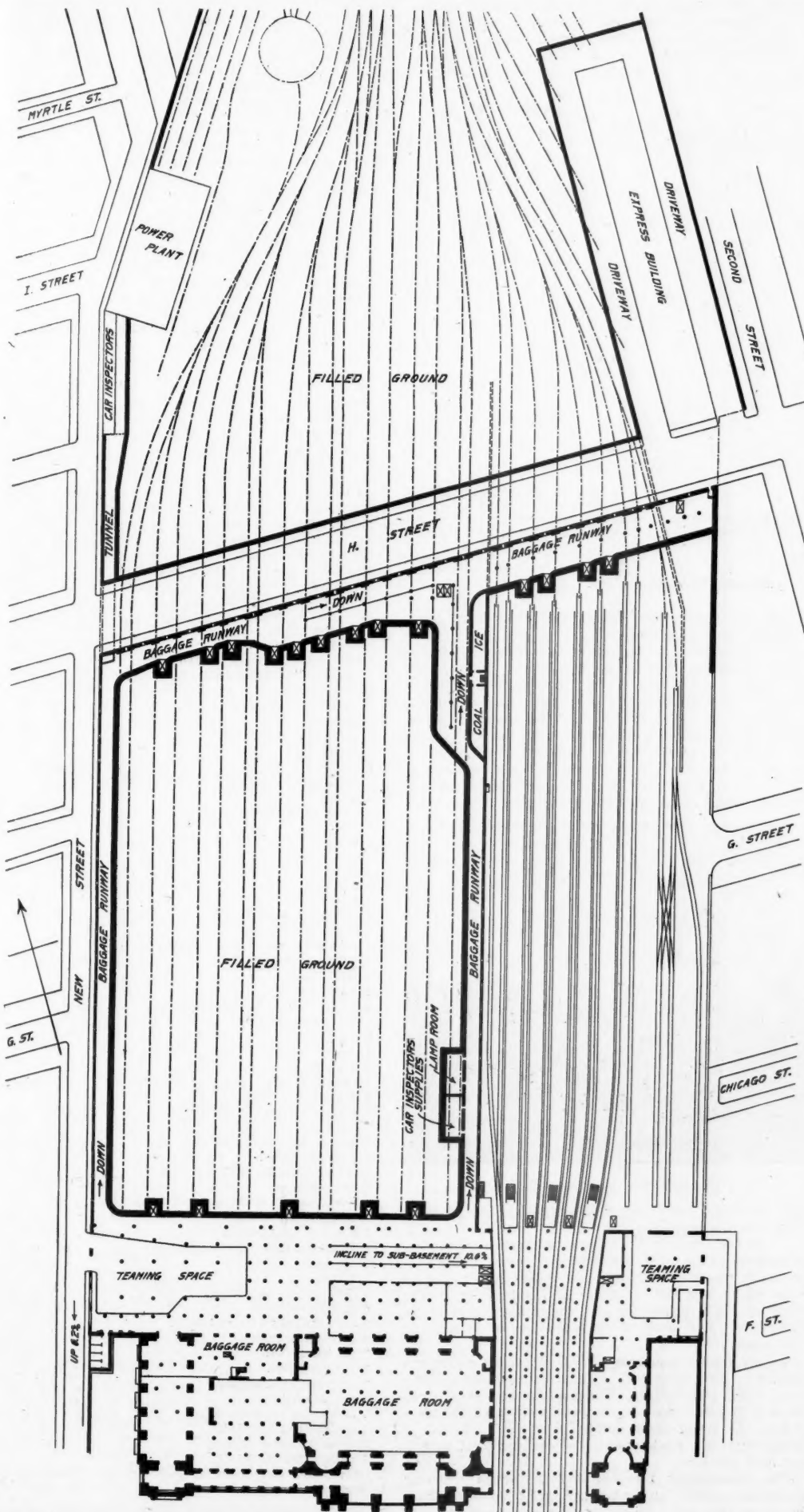
The accompanying plans of the tracks in and beyond the station show 18 stub tracks on the concourse level and eight through tracks on the basement level, leading from the tunnel, with three storage tracks along the eastern side for baggage and mail cars. The stub tracks are divided into three groups, each operated from a separate signal bridge placed just beyond the end of the platforms. The four tracks on the extreme western side of the station are served from one ladder track which is connected by a cross-over to the ladder track serving the second group of four tracks. The third group includes the remaining ten stub tracks on the eastern side of the station. These converge to six tracks beyond the signal bridge and are interconnected with cross-overs so that each track may be entered from any of the approach tracks, although there is no ladder track serving all the others. One signal bridge also controls the movements on all of the eight depressed through tracks and the lead to the three storage tracks. These through tracks are all served from one ladder track which leads to the main line approaches. A number of storage stub tracks are carried into the unloading platforms at the side of the express building on the east side and up to the power plant on the west side. In the tunnel under the station building and plaza the eight depressed tracks are reduced to six.

The concourse, 130 ft. x 750 ft., is divided its entire length by the usual fence, placed 85 ft. from the station building wall. There are 13 gates in the fence, four of which will be used in handling the passengers to and from the depressed tracks. The train platforms for the stub tracks are on a level with the concourse floor and those for the through tracks are reached by three broad stairways. The stub tracks enter the station from the north on an ascending grade of .53 per cent. and the through tracks on a descending grade of .825 per cent., so that the platforms have corresponding grades which, however, are not heavy enough to be an inconvenience to passengers.

The drawings show 15 platforms on the upper level and five on the lower. Of the 15 platforms on the upper level, five will be used for handling baggage, mail and express matter exclusively, each platform serving two tracks. At the end of these, next the concourse, will be placed elevators leading to the baggage rooms in the basement. Elevators will also be placed at the outer end of these baggage platforms and also at the end of five of the passenger platforms to handle the baggage from trains standing on the tracks not served with the regular baggage platforms.

The form of umbrella shed proposed is shown in the drawing. The passenger platforms are to be 915 ft. long and 20 ft. 7½ in. wide, of 6-in. concrete laid on cinders and faced with 1 in. of cement. They will have 1½ in. slope on each side for drainage. The umbrella shed will be supported on 12-in. round columns 9 ft. 7 in. high, with ornamental caps, spaced every 15 ft. down the center of the platform. Heavy plate girders resting on the columns will form a ridge pole from which the web carlines are supported. The roof is to be copper covered, supported on I-beam purlins, and the middle panel on each slope is to be of ¾-in. wire glass to admit ample light. A copper lined gutter down the center of the roof carries off the drainage through drains running down inside of the supporting columns. The clearance lines shown on the drawing indicate the position of the cars with reference to the roof and platform and show the ample protection against the elements which the umbrella shed affords. For the baggage platforms the sheds and platforms will be similar in form but only 17 ft. 3½ in. wide.

The basement plan of the station shows the arrangements for handling baggage in and out. Nearly the entire basement under the station building will be used for this purpose and for the handling of mail matter. The level of this floor is 16 ft. below the concourse and it is reached on the east and west sides of the building by a driveway



Proposed Basement Plan of Station—Washington Union Station.

descending from the plaza level on a 6.2 per cent. grade. On the west side of the basement are the main baggage sorting and storage rooms with a large teaming space for loading and delivering to and from the transfer companies' wagons. Baggage from the trains standing on the high level tracks above is delivered to the sorting rooms either by the elevators at the south end, which open directly into the large space under the concourse, or by the elevators at the north end, which open into the runway shown, which is parallel to H street. From here it may be brought to the sorting rooms up the runways next to the side retaining walls. These are 16 ft. wide and are on a slightly descending grade from the station building. The runway next to the H street retaining wall is 42 ft. 6½ in. wide at the eastern end and is on a descending grade so as to pass under the depressed tracks. Four elevators opening on to this runway serve all the through tracks, there being none at the south end, since all the through trains will enter from the south and discharge baggage usually from the forward cars.

Under the eastern end of the station building are the mail sorting rooms, reached by a driveway along the side

of the building. But the Canton of Berne has a law requiring the closing of such places of entertainment after a certain hour of the night, and it made no exception of the station restaurant. Whereupon the Confederation authorities protest. They alone, according to law, may control the building and operation of the railroads, and to the operation belong all things necessary to the safety, convenience and comfort of the passengers—the stations, the waiting-rooms, the water-closets, the restaurants; and the cantons may not interfere.

The Lackawanna Wrecking Outfits.

In the *Railroad Gazette* of Dec. 4, 1903, a description was published of the organization of the wrecking outfits on the New York Central. In continuation of the series which will take up this organization on several leading railroads, the present article describes the outfits on the Delaware, Lackawanna & Western, which differ in some important particulars from those on the New York Central. The primary difference is that the organization is in charge of the road department, handled by

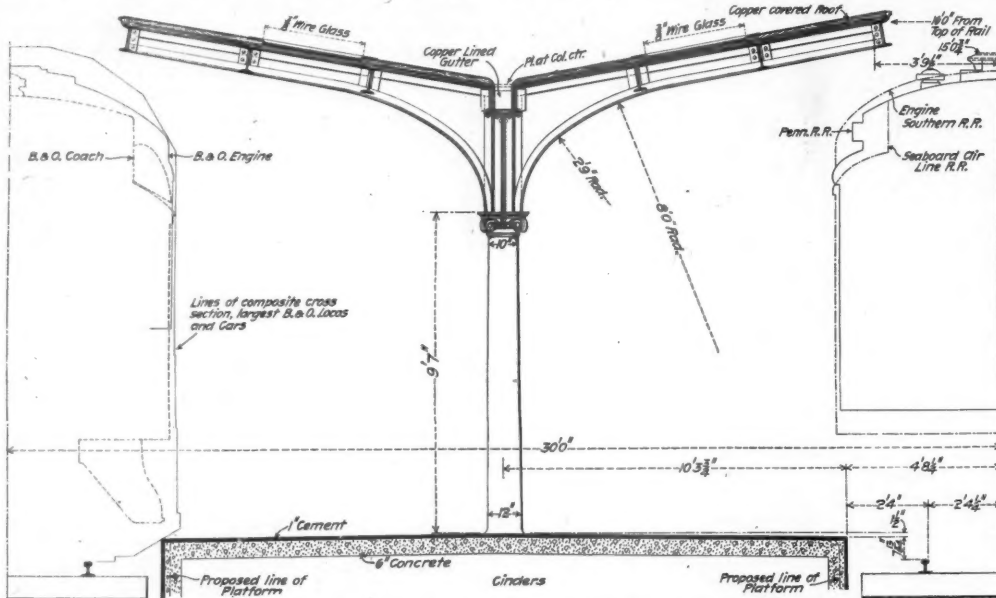
that the cars are kept in order and the tools in shape for instantaneous service. As previously said, he reports to the division roadmaster. Necessary provisions are carried at all times and are ordered on requisition through the road department. To call the men a telephone system is used.

The steam cranes are equipped with air reservoirs and kerosene reservoirs for lighting purposes. Wells light burners are used on all wrecking cranes and the cranes are also equipped with siphons to lift water from boilers, tanks, etc., and to secure the necessary water to fill their own tanks for steam purposes.

A siding is set apart in the yard at each point where the cranes are located. These sidings have the necessary water and steam attachments, coal bins, wood bins and oil tanks. They also contain storage tracks to receive trucks of all types, as with the New York Central outfits. The necessary trucks are kept on cars to meet the requirements and replaced from the storage track. The following tools are carried:

- 2—50 ton Norton jacks with hooks.
- 2—50 ton hydraulic jacks with hooks.
- 2—30 ton low hydraulic jacks.
- 2—30 ton high hydraulic jacks.
- 2—20 ton hydraulic jacks.
- 2—15 ton hydraulic jacks.
- (All dudgeon jacks.)
- 2—20 ton foot jacks from 10 in. to 18 in. lift.
- 2 track jacks.
- 2 screw head jacks 18 in. lift.
- 2 screw jacks 14 in. lift.
- 1 screw head jack 15 in. lift.
- 2 steamboat ratchets.
- 17 link chains, assorted lengths, with hook and link.
- 12—¾ in. small chains.
- 7 common frogs for 4½ in. rail.
- 5 common frogs and wedges for 5 in. rail.
- 2 common frogs and wedges for 4 in. rail.
- 2 heavy locomotive frogs and wedges for 5 in. rail.
- 5 pair Alexander replacers.
- 5—5 in. rope slings.
- 5—6 in. rope slings.
- 5—3 in. rope slings.
- 2 sets sheave blocks, 10 in., with rope.
- 2 sets sheave blocks, 8 in., with rope.
- 1 set sheave blocks, 6 in., with rope.
- 300 ft. 15 in. manila rope.
- 150 ft. 12 in. manila rope.
- 400 ft. 9 in. manila rope.
- 1000 ft. 6 in. manila rope.
- 200 ft. 4 in. manila rope.
- 100 ft. 15 in. drag rope.
- 100 ft. 12 in. drag rope.
- 100 ft. 7 in. drag rope.
- 2 1 in. crucible steel cables, 75 ft. long.
- 40 ft. 2 in. wire drag rope.
- 2 Wells lights complete.
- 12 white lanterns.
- 5 red lanterns.
- 25 torches.
- Assortment of sledges and wrenches.
- Assortment of cold chisels.
- 12 track chisels.
- 6 spiking hammers.
- 7 punches.
- 6 short chisel bars.
- 6 lining bars.
- 2 claw bars.
- 1 set long chisel bars.
- 6 cant hooks.
- 5 short hand spikes.
- 1 vise.
- 1 set grips for pulling coupling pins.
- 2 crosscut saws.
- 6 axes.
- 3 hatchets.
- 1 hand saw.
- 8 scoop shovels.
- 1 dozen flat shovels.
- 1 set clamps for engine springs.
- 8 pairs rubber boots.
- 8 sets oilers.
- 2 waste buckets.
- 3 sets climbers for telegraph work.
- 1 set track gages.
- 3 wheel gages.
- 1 keg cut spikes.
- 2 kegs track bolts.
- 25 assorted iron blocks for blocking up driving wheels.
- 1 set marine spikes.
- 9 preventer links, assorted sizes, to be used for broken chains.
- 2 sets of ladders, 15 ft. to 30 ft.
- 2 sets pike poles.
- 1 set eyebolts for lifting trucks.
- 2 gal. kerosene.
- Assortment of car brasses and locomotive brasses.
- Assortment of blocks.
- 1 spool telephone wire.
- 1 telegraph table and instruments.
- 1 car sealer.
- 1 stretcher.
- 6 sets grapple hooks.
- 6 sets stone hooks.
- 2 sets rail shackles and keys.
- 2 sets sister hooks.
- 1 set box rollers.
- 1 set spreaders.
- 2 sets extra outriggers.
- 5 gal. alcohol.
- 6 sets extra air hose.
- Assortment of king-bolts.
- 3 Dressel station lights.
- 4 pairs extra trucks.
- Canvas and baskets for perishable goods to handle freight in stormy weather.

We are indebted to A. J. Neafie, Principal Assistant Engineer of the Delaware, Lackawanna & Western, for the information and photograph courteously supplied.



Cross Section of Umbrella Train Shed, Showing Clearance Lines.

of the building and also having a large teaming space. These rooms open on to the mail storage tracks and platforms.

H street is carried under the station with a width of 80 ft. Heavy masonry or concrete retaining walls will be built up to support the filled ground on which the stub tracks and much of the yard beyond is laid. The through tracks will be laid at practically the present grade.

The express companies' building, 60 ft. x 420 ft., will be situated at the north end of the station and on the east side. It will be served with seven tracks with the necessary loading platforms, all of them on the level with the main yard. The building will have a basement on a level with H street and a covered driveway opening into H street will run completely around it. On the upper level a similar driveway will run down along the side of the station and open into G street. This will give ample teaming facilities for the express business.

The power plant, 80 ft. x 185 ft., and a car inspector's storehouse, 30 ft. x 150 ft., will be situated almost directly across the yard from the express building. A power tunnel, connecting the power house and the station, is shown next to the west retaining wall, on the basement plan. A turn-table just beyond the power plant will be used for emergencies, but all the roundhouses and car storage yards will be outside the city limits.

We are indebted to D. H. Burnham & Co., Chicago, the architects of the station, for the plans shown.

Foreign Railroad Notes.

The Siberian express between Moscow and Irkutsk, now running four times a week, beginning with January 14, will run five times a week.

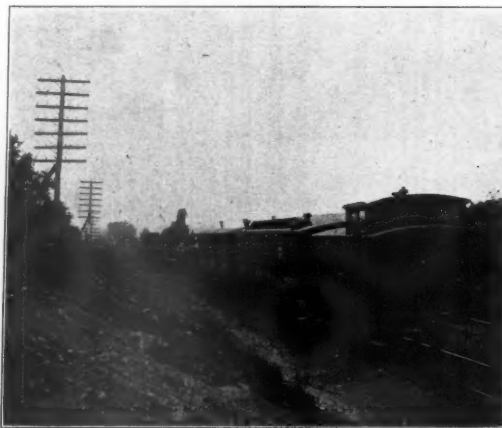
An English military officer recently returned from China, over the Siberian Railroad, is reported as saying that if that railroad were to be taxed by a movement of the army and its supplies such as would be necessary if Russia should go to war with an Eastern nation, it would break down within one week.

The Prussian State Railroads have recently completed at Opladen extensive locomotive repair shops which are not only very extensive, but are equipped with more modern and effective machinery and tools than any others in Germany. There is not a steam engine on the premises; but the machinery is driven by electricity, and the dynamos for generating it by three 200 h.p. gas engines. The shops have been three years under construction.

The Swiss railroads have a restaurant where wines, etc., are served at Berne, the capital, where trains arrive and depart at night as well as by day, and where passengers seek refreshment sometimes in the small hours of the night. These railroads are now the property of

the division roadmasters, instead of the car department, as on the New York Central.

The Lackawanna wrecking outfits are located at Hoboken, Scranton, Binghamton and Mount Morris, and are equipped with 50-ton steam cranes made by the Industrial Works at Bay City, Mich. Each outfit contains a house and tool car in which are placed the steam crane tools and the necessary equipment for it, with quarters for the use of the engineer of the crane. This boarding car is equipped with cooking utensils, supplies, sleeping quarters, etc. The train also has one blocking car, one tool car, and one commissary car equipped to accommo-



Lackawanna Wrecking Train.

date 16 men. The cars are steam heated and provided with everything necessary for clearing wrecks.

As with the New York Central, no special locomotive is assigned to the train, but the steam cranes are located at points where a locomotive can always be obtained at short notice and the remainder of the train is always made up. The cranes are kept under a pressure of 70 lbs. steam. Each outfit covers a territory of from 60 to 100 miles.

To supplement the steam crane outfits hand outfits are located at Stroudsburg, Kingston, Elmira, Buffalo, Syracuse, Utica and Bangor. These outfits consist of from three to five cars made up in practically the same manner as the steam crane outfits, being equipped with a commissary car, blocking car, tool car and hand derrick for light wrecking.

The organization provides that the steam wrecking cranes and outfits shall be manned with a foreman, steam crane engineer and from six to eight competent wrecking men. The wrecking foreman is in charge and must see that the outfit is in first class condition at all times and

Single-Track Working with Few Train Orders.

On a short section of the Norfolk & Western Railway, between two double track sections, trains are run under the telegraph block system, combined with dispatcher's orders, issued to operators, in a way which seems to be nearly as simple as the electric staff, and we are informed that this practice has been in vogue at that place about four years. There are from 20 to 25 trains each way daily. Previous to the double tracking of long sections of the road this plan was used at a number of other places. The usual methods of procedure are described by an officer of the road as follows:

There is a section of single track from A eastward to B, the ends of two sections of double track. In order to move trains without orders, we govern their movement as follows: All eastbound trains (eastbound trains having right of track) proceed from A to B when block signal indicates clear.

Westbound trains are advanced from B to A only by "31" orders. These orders are issued to the operator, instead of to conductors and engineers, and such trains have right of track over all opposing trains when the block signal indicates clear.

Copies of orders received are not to be delivered to trains, except that if an eastbound train or trains arrive at A before a westbound train which has been given right to the single track has cleared the operator at A delivers a copy to the first one of such train, and operator at B delivers copy of order only to last train given right of track thereby, when the order includes more than one train.

A conductor of a westbound train receiving a copy of such an order at B will deliver it, without stopping train, to operator at A from rear car; and operator at A will not display a clear signal for eastbound trains until the order has been delivered to him as indicated, and he has compared it with order he has, requiring him to hold all eastbound trains, and in addition, has personally observed that all trains mentioned therein have cleared. For example:

"To operator at A and B."

"Operator at B will permit train No. —, engine —, to go to A."

Under this order the operator at B, provided the block is clear of all trains in the same and the opposite direction, will give the train a signal indicating clear block; and operator at A will display block signal indicating "stop," and in addition, will display a red flag, or a red lantern light by night on semaphore signal mast (which can be removed only by hand), and hold all eastbound trains until the train named has cleared.

Work extras in either direction between A and B move only under protection of flag, according to rule. When the block is not occupied by an opposing train or by a passenger train in same direction, operator may give the work train a clearance card reading, "I have no orders for your train," or "no further orders" (as the case may be), "signal is out for block not clear."

Should the telegraph wires fail, preventing communication between A and B, operators and trainmen are to be governed in accordance with time-table rules Nos. 11 and 13, which are, in effect, move according to train rules and time-table rights, or by special orders that may hold, and without regard to the block, until a telegraph office is reached where block is operated. Under the system here explained all eastbound trains are given a clear signal and moved under absolute block, except when a westbound train is advanced.

Piece Work, Premium and Bonus Systems.

BY HARRINGTON EMERSON.*

The fundamental trouble with piece work, in addition to its lack of justice, is that it makes the workman sell what is not his to sell, namely, output. When Mr. J. J. Hill formulated his famous principle that railroad expenses were by the train mile and receipts by the ton

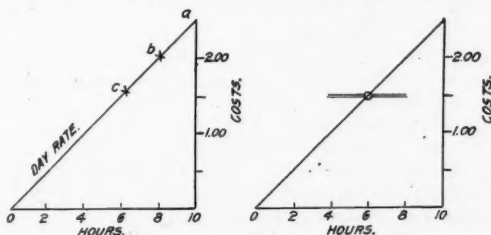


Fig. 1.

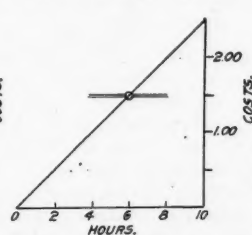


Fig. 2.

mile, neither his train crews nor himself ever dreamed of putting the pay of the men on a tonnage basis. The engineer who hauls sixty 80,000 lb. cars with a hundred ton engine gets no more than the engineer who obeys orders, standing for hours on a side track. The engineer sells his time, his skill, his intelligence, his obedience, but never output, because that depends on conditions over which he has no control; and it has always been a wonder to me that railroads which manage their train problems should be so backward in their machine shop practices and methods.

What the employee sells, whether in office or shop, is not his "output," but primarily his time and his skill, incidentally his intelligence and his obedience. That many shops pay by piece work is no argument in favor

*Discussion of Mr. Frank Richards' paper on Piece Work, December meeting of American Society of Mechanical Engineers.

of the plan, since more shops pay by day work; and, as Mr. Barth in his slide rule paper, presented at this meeting, only too moderately remarks, the usual way of running a machine shop appears little less than absurd.

The experiences of Mr. Taylor, Mr. Gantt, Messrs. Dodge & Day, Mr. Barth, myself and Mr. Parkhurst, who have carefully studied the output and results in innumerable machine shops, prove that the wastes going on are more than absurd. As an example of old practice against new, I hold in my hands the original figures of the skilled and competent engineer of a large shop, who estimated the cost of a certain job at \$4,575, of which \$3,300 for materials and \$1,275 for labor. The work came under my direction after it was one-third completed, and was pulled off with four men in three months for a total cost of \$3,375.09, of which \$622.79 for labor, netting a profit of \$1,824.91, instead of \$629, as estimated—nearly three for one, yet some of the men on that job were paid a bonus of nearly 100 per cent. above their regular wages. I also hold a routing card of one of my assistants, Mr. Parkhurst, in which a car shop job, marking and moving 200 pieces of oak, was estimated by the foreman to require two days, but was actually completed in 2 hrs. 25 min. on a 50 per cent. bonus basis. This is what Mr. Taylor's methods will do when applied to an old time shop.

In planning jobs of this kind, we pay no attention to what has or is being done. Former practices have absolutely no interest for us. We figure out the time the job ought to take under existing conditions, and we pay the man a generous bonus, which must be enough to call out the best that is in him. If the conditions appertaining to the job are changed, either for better or worse, we again determine the minimum times and pay the man a bonus for his co-operation. These illustrations show that astounding results follow the plans Mr. Richards condemns without understanding them, and that there is no argument whatever in appealing to present practices.

Mr. Richards's diagrams and his reasoning and conclusions are erroneous, because he bases them on output, which does not properly enter into the matter at all, as diagrams based on time instantly show.

I assume in all cases wages of 25 cents an hour, a usual time eight hours for a given job, a slow time of

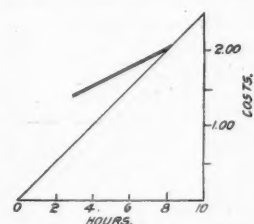


Fig. 3.

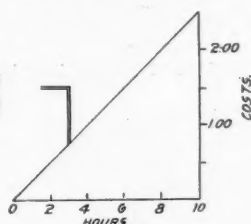


Fig. 4.

10 hours, a fair time of six hours, a piece work time of five hours, a Taylor bonus time of three hours. Time, days, hours, minutes—in this case hours—are measured on horizontal lines, wages by the week, day, hour or minute—in this case hour by the hour—are measured vertically.

Diagram (1) Day Work.

(a) slow day; (b) average; (c) fast day under good foreman.

Normal cost 8 hours to employer, \$2.00; wages per hour, 25c. Slow cost 10 hours to employer, 2.50; wages per hour, 25c. Low cost 6 hours to employer, 1.50; wages per hour, 25c.

The employer makes all the gain or loss. He is stimulated to good foremanship and better equipment, but the constant tendency is to deterioration.

Diagram (2) Piece Work.

Piece work cost at 6 hours, \$1.50; wages per hour, 25c. Piece work cost at 8 hours, 1.50; wages per hour, 1875c. Piece work cost at 4 hours, 1.50; wages per hour, 375c.

This is exactly the reverse of day work. The employee makes all the gain or loss, and is afraid to cut time for fear wages will be cut.

Diagram (3) Halsey Premium.

Cost to employer at 10 hours, \$2.50; wages per hour, 25c. Cost to employer at 8 hours, 2.00; wages per hour, 25c. Cost to employer at 6 hours, 1.75; wages per hour, 29c. Cost to employer at 4 hours, 1.50; wages per hour, 375c.

The chief merit of this plan is that it obviates the necessity for change in piece rates. It has worked admirably in certain shops steering a half-way course between the injustice of day work and of piece work, but it is not fitted to cope with the unexpected. If there are no improvements by the employer there is no reason why the employee should not get in full the increased result due to his greater diligence and skill, but if improvement is due to the employer's better equipment there is no justice in giving the employee any part of it.

Diagram (4) Taylor Differential Piece.

Cost to employer at 3 hours, \$1.50; wages per hour, 50c. Cost to employer at 2 hours, 1.50; wages per hour, 75c.

If employee habitually falls below three hours he is not wanted.

Here for the first time attention is concentrated on the reasonable maximum of production and the reward made proportionately great. Not only is there no attempt made to cut piece work prices, but the reward is withheld unless the maximum is done. The great difference between this and ordinary piece work is that Mr. Taylor demands the payment of a high premium,

often 100 per cent., a figure that would frighten most employers, in order to effect maximum reduction in cost. If the employer introduces improvements, times are with justice shortened but not the premium per hour; if equipment deteriorates times must be lengthened but the same premium be paid per hour.

Diagram (5) Gantt Bonus.

Cost to employer at 6 hours, \$1.50; wages per hour, 25c. Cost to employer at 3 hours, 1.50; wages per hour, 50c. Cost to employer at 2 hours, 1.25; wages per hour, 625c.

The difference between the Taylor and Gantt plans is that the former pays by the piece finished in a definite time, while the latter pays by the definite time for a completed job, and pays the bonus, not for the piece but for following instructions.

Mr. Gantt does not admit that under his system the workman could better the time set and therefore objects to the supposition of two hours on a three-hour job; but I extend the diagram theoretically in order to show the difference between Taylor and Gantt. Taylor is more severe and more generous.

After careful study of the Taylor and Gantt diagrams, Mr. Parkhurst and myself, adhering absolutely to the Taylor and Gantt theory of time unit study and

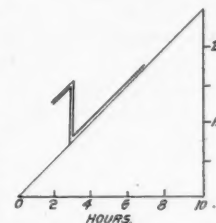


Fig. 5.

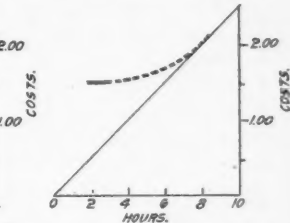


Fig. 6.

specific directions of all operations, have used other diagrams, less severe than Taylor and Gantt, and permitting us in an old shop, where tool, machine and labor conditions are not modern, to keep the ideal always in view, yet we reward any gain shown by the workman. We determine with all the skill at our command the time a job should take, and adopt the Taylor line, based, however, on time and not on piece, and then run back to the day line.

Diagram (6) Emerson Parabolic.

Cost to employer 10 hours, \$2.50; wages per hour, 25c. Cost to employer 8 hours, 2.00; wages per hour, 26c. Cost to employer 6 hours, 1.75; wages per hour, 29c. Cost to employer 4 hours, 1.50; wages per hour, 375c. Cost to employer 3 hours, 1.50; wages per hour, 50c. Cost to employer 2 hours, 1.50; wages per hour, 75c.

Diagram (7) Parkhurst Combination.

Cost to employer 8 hours, \$2.00; wages per hour, 25c. Cost to employer 6 hours, 1.68; wages per hour, 28c. Cost to employer 4 hours, 1.56; wages per hour, 39c. Cost to employer 3 hours, 1.50; wages per hour, 50c. Cost to employer 2 hours, 1.50; wages per hour, 75c.

The essential difference between these diagrams and the Halsey premium line is not that they are curved and it is straight, but that it begins with an accurate and probably justly determined rate and drifts mathematically, but not scientifically, into space.

Mr. Parkhurst and myself begin with the scientific maximum of output and reward for endeavor, and, as a mere matter of shop convenience curve backwards to the day rate line. There is no special merit in the parabola or in the straight line, other lines might answer practically as well. The main point is that a little improvement gets a little taste of reward, and a big improvement gets a great big reward.

When all conditions are properly under control, I much prefer the Taylor diagram based on time. There is something inspiring in working out a minimum

time, in knowing that it can be made with the regularity that a train makes its fast schedule, in proving it, in stimulating the workman to it; but it is equally discouraging to workman, to expert and to employer to be wrecked in full flight by hard iron from the foundry, by variable speed in the engine, by broken belt on main shaft, by any unforeseen and unforeseeable delay, and in such cases the curve back to day rate prevents much trouble.

In all these diagrams, except day rate, the employee is benefited by reduction in time; in all these diagrams, except piece work, the employer is benefited by reduction in time, and reward for reduction in time is apportioned exactly as it should be, only by the Taylor method and its modifications.

The employer must pay big bonuses or he cannot get results. He can afford to pay big bonuses, for even if he gives all the gain in time to the employee he makes on increased efficiency of plant and diminished overcharges.

Where, in all these lines and curves, when based on time, is there any support for Mr. Richards's contention that they cannot be effective because, as he claims, they offer a reduced incentive at the precise time when the need of incentive is most urgent. Exactly the contrary is true. They all of them offer, just as piece work does, ever increasing pay, which, if pushed to the theoretical limit, would reduce costs to almost nothing, and give the employee an infinitely large sum per day.



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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

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The Chicago & North Western was subjected to unpleasant notoriety last week by a widespread newspaper paragraph to the effect that eight fast trains had disregarded a signal in which the light had been purposely extinguished to test the engine-men. The report said:

"Stirred by the Pere Marquette wreck, North Western Railway officials to-night decided to make a secret test of the fidelity of their men. At Mayfair, on the main line, the officials took possession of the station and to the astonishment of the agent put out all the semaphore lights. To the chagrin of the officials, one passenger train after another passed by without the slightest slowing up until no less than eight trains had whizzed along. This included the fine North Western Limited. After the trains had passed the lights were again lit and the officials went back to headquarters and laid off all of the eight train crews for 90 days."

For the reassurance of the public it may be observed that the North Western has tested its men in this way before, not waiting for a warning from Michigan. These tests have been reported in the *Railroad Gazette*. The company has expended large sums for automatic block signals on hundreds of miles of its lines, and is taking the rational course of trying to get the full use of them; to see that its engine-men obey them. The officers are to be commended for having made them; and are at fault, if at all, for not making more of them. But the facts are not fairly stated. We learn that 15 engine-men were tested at Mayfair and that only four ignored the light. Many tests were made at the same time at other places and no engine-men were caught. Although this was an exposure of defective discipline, the case does not involve such palpable danger as at first appears; for each of those four engine-men could have seen, and doubtless did see, the daylight signal by the light of his headlight. Where the arm, or board, or disk, is visible, the lamp can be looked upon as an auxiliary and not as the main signal. The engine-men did so consider it, no doubt. This is not a justification; it is mentioned here as a reminder that signaling is not so simple as it sometimes seems. This very question in discipline was the subject of a note in these columns last week.

The apprenticeship system of the Baldwin Locomotive Works has been amply justified by three years of working. The report for the period since Jan-

uary, 1901, is printed in full, elsewhere in this issue. Some of the first and third class apprentices who were indentured shortly after the system was put in operation have completed their time during the past year and all have found employment with excellent prospects. There are also in the works 18 special apprentices from foreign countries, who are there to learn American methods. One other noticeable feature of the report is the comparatively large proportion of third class apprentices, most of whom are graduates of higher institutions of learning, and also the preponderance of machinist apprentices to the exclusion of the other trades. In a plant of this size, employing more than 14,000 men, supplying the demand for skilled mechanics is a serious problem, but it seems to have been met by organizing and systematically training the minds and hands of a constantly recruited body of intelligent young men, from whose ranks men can be drawn who are familiar with the processes and routine of the shop in which they have been trained, and who are imbued with a spirit of loyalty and conscientious endeavor which is oftentimes worth more to the employer than mere skill and dexterity. In England and on the Continent apprentices pay to learn a trade as they would pay to go to school, but, so far as we know (and possibly we are in error), they are not necessarily encouraged and given an opportunity for advancement. This is the natural result of the oversupply of labor which prevails there and the antagonism of the labor unions as well, which oppose the unlimited training of apprentices on the ground that they take work away from the journeymen mechanics. Here, however, the opposite condition holds, of a scarcity of highly skilled labor, which makes it imperative for the future industrial prosperity of the country to train young men to do more and better work with modern and improved methods. If the benefits to be derived from the use of improved labor-saving machinery are to be fully realized, the men who handle the machines must be taught to utilize to the best advantage every turn of the wheels. A poor workman cannot do good work on the best machine. The young man who is quick to learn and willing and anxious to put his learning into practice, is the man to encourage. A record of the men who have served their time at Altoona, on the Pennsylvania railroad, and who have become general officers, would be extremely interesting. Such an alumni list we have not seen.

The Piece Price System at West Albany.

The success of piece work depends on the care and fairness with which the schedule of prices has been worked out, and, even more important, the subsequent changes in those prices, which requires not only a fine judicial quality in the boss, but also an absolute confidence in that judicial quality by the workman. The hesitancy of the workman in accepting a piece price rate is due to his fear of being cut after he has demonstrated his ability to increase his productiveness and earning capacity. At the West Albany shops of the New York Central, the car repairers have been placed on a piece price basis, and from personal contact with the men, the writer is convinced that it is successful both for the workman and for the company. Before the adoption of this plan, the men in the general repair shop were getting 19 cents an hour. They now make about 27 cents an hour, while some make 33 cents an hour. The men are guaranteed a minimum rate of 19 cents an hour and they are given an option on day rate or piece rate. Needless to say, all the men have accepted the piece price schedule. The time required to perform all the primary operations in the repair of cars of different designs has been carefully noted by means of stop watches—the fair rate being obtained from the average time required by different workmen. Having once determined the key prices, any composite operation can be given a fair rate. For example, it has been found that 5 cents is a fair price for removing or replacing a 10 in. bolt, 4 cents for an 8 in. bolt, etc. When a car comes into the shop, the inspector marks on the car the repairs which are to be made and the price for these repairs is fixed. On certain types of cars the workman gets 45 cents for removing the first needle beam, and 35 cents each for all other needle beams. This is obviously fair, as the time consumed in jacking up the car, loosening the truss rods, etc., is a charge against the first needle beam and need not be considered again. The rate for stripping the interior of a passenger coach is based on the time required to remove 12 different kinds of screws. A fair allowance is made in all cases for the time taken by the men in tending to their personal wants. The men are encouraged to

present their grievances to the management, and every complaint is thoroughly investigated. This policy deprives the walking delegate of his power.

The records show that the company has increased its output at the car shops about 35 per cent. The men have learned to systematize their work. Little time is wasted in running about the shop looking for material or tools. If a jack needs repairs the foreman is immediately apprised of the fact, and before a job is commenced the workman takes pains in seeing that all new material is at hand. When new methods or labor saving devices are introduced, the schedule is changed, but no trouble is experienced, as the men have absolute confidence in the motives and fairness of those in charge.

Twice Told Tales.

The cause of the collision at Willard, Kansas, resulting in nearly a score of passengers killed, on January 6, is not singular; it is of a kind that has been clearly reported in the Government quarterly bulletins. When such a cause and its frequent tragic results are clearly and repeatedly emphasized in the Government reports; and when railroad officers fail to learn and apply their lessons, an unanswerable argument is given to the Interstate Commerce Commission in its request for a compulsory block signaling law.

The cause of this collision is explained quite clearly in a statement made by Conductor Nagle of the passenger train. He said that he had orders concerning two stock trains which he was to meet. For one of these he was to wait at Valencia till 12:58 a. m.; the other he was to meet at Willard, four miles farther on. The leading stock train had not reached Valencia at 12:58, and the passenger train went on. Knowing, therefore, that there were still two trains to meet, he went past Willard seeing only one train there. Exactly what the engineman did, or concluded, or what his processes of thought may have been, is not told; but as the conductor says that at Willard the train was going 50 miles an hour, the conclusion appears to be warranted that he was not exercising extreme care. The conductor was prevented by steam and the high speed from seeing the number of the engine on the side track. In other words, the rule requiring both conductor and engineman to know what trains they meet was disregarded. He trusted the engineman to take the whole responsibility.

This collision is almost exactly like one reported in Bulletin No. 7, for the first quarter of 1903, which was reprinted in the *Railroad Gazette* of July 31. In that bulletin the table of prominent accidents shows a butting collision, Item 20, No. 47, in which two persons were killed and two injured, and which damaged the property of the company to the extent of \$9,510, which was due to the failure of the trainmen to identify a freight train standing on the side track. The engineman and fireman of the passenger train were killed, so that the precise nature of their negligence cannot be determined; but the conductor, the baggageman and one brakeman saw, on the side track, engine No. 168, when the one they were ordered to look out for was No. 169. At the examination these men said that they thought it was No. 169 that they saw.

In Bulletin No. 6, for the last quarter of 1902, a similar blunder was reported (*Railroad Gazette*, May 8, 1903). Item 5, No. 10, in that bulletin records a collision of freight trains in which two persons were killed and five injured, and the damage was \$3,000, due to the mistake of an engineman in identifying a train on the side track. The train which he was to meet had not arrived; but a dead engine stood there, and the engineman of the passing train took that for the head of the train that he was looking for. Of course, every superintendent is or should be familiar with the lessons of experience which teach the danger here shown, but here we have in addition the official reports, which condense the experience of the entire country.

There is a rule on some roads, the Chicago & North Western for one, that at meeting points conductors and engine-men must inform each other by word of mouth (in some cases by written memorandum) of the numbers of their respective trains; but, unfortunately, it seems to be deemed necessary everywhere to make many exceptions to this rule; and the situation at Willard was just the kind at which an exception would probably be allowed. This real or supposed necessity for constant modifications is one of the convincing reasons for the conviction that the block system is the only satisfactory remedy for collisions; so that the moral of Willard is the same as that of the other notable recent collisions.

The New Haven's Electric Problems.

President C. S. Mellen, of the New York, New Haven & Hartford Railroad Company, when several years ago one of the Vice-Presidents of that corporation, expressed himself in vigorous terms against the electric ventures of the company, begun by President Clark and continued by his successor, President Hall. The special objects of Vice-President Mellen's adverse criticism were the plans, later carried out, of electrifying certain steam branches of the company to meet new trolley competition. He held that the electrical equipment of steam roads was an untried novelty; that it involved too high initial cost in a field of experiment; and that "mixed" service by both steam and electricity on one of the double tracked lines violated a sound principle of railroad operation. Upon his return to the road, as president, a few months ago, he said that he would make a careful investigation of the electric lines of his company before determining his policy; and, in fact, he has already pushed such an investigation and it is still in progress.

Its outcome will be looked for with much interest, not merely because this company has been a pioneer in electric roads on a large scale but because of the varied character of its electric enterprises and the complex nature of the problems which they present. The corporation now owns or controls nine electric lines, including former steam lines to which electricity has been applied either by third rail or trolley. The nine lines comprise about 182 miles of single track with gross receipts during the last year for which returns have been published of \$772,666, and operating expenses of \$425,661. Such a fiscal statement on its face seems to indicate successful operation, high profits and results which justify the company's bold electric undertakings. But, in fact, the returns for operating expenses involve some extremely important qualifications. They do not include charges for depreciation of plant, interest on costs, or, in the case of electrified steam roads, the cost of maintenance of way which is charged up to the operating steam corporation. The second of these charges, which the company has never yet disclosed, is of exceptional importance in view of the fact that very large sums were spent in experiment and many costly changes have been made from time to time in the electric plants—some of those changes very recently. The missing items go far to mystify the returns and represent a general phase of the electric problems which confronts the President at the outset of his inquiry.

The nine electric lines of the company divide naturally into three groups:

(1.) Trolley roads four in number, with a total trackage of about 88 miles, incorporated as independent companies, operated separately—as regards finances—from the steam corporation and bought up or built to "break" projected long distance and rival parallels. Three of these four lines have been successful as a part of the New Haven Company's policy. They have thus far thwarted long distance parallel enterprises of a competitive character and they have paid operating expenses, fixed charges and something more, but without earning dividends on stock. The three lines, as protective obstructions to rival projects, are practically sure to be left undisturbed. The fourth member of the group is the Worcester & Connecticut Eastern trolley company, with a line reaching some 40 miles southward from Worcester, Mass., and closely paralleling the Norwich & Worcester division of the New Haven system. It is that unique enterprise of "self-parallelism" designed by President Hall to ward off threatened parallels and, at the same time, serve as a kind of lateral for freight traffic to factory villages. It has been financed chiefly by bonds and the New Haven corporation is essentially a "holding" company through a moderate cash investment in stock. How the new President will treat such a novel proposition cannot be absolutely forecast, but it is certainly one of the most interesting of his diversified electric problems. If he drops this line, a short extension to tide water would make it a long distance parallel of the Norwich & Worcester Division, competing probably in freight as well as passenger traffic; if he holds it, there may be considerable financial loss. Moreover, the case is complicated by the fact that the bonds of the trolley corporation have been marketed to a certain extent under the name of the New Haven Company, five of whose officers appear in the trolley directorate. Under the circumstances this trolley system will probably be retained and, perhaps, enlarged. In this connection the defeat by the last Connecticut Legislature of the bill to make the Worcester & Connecticut Eastern bonds a legal investment for savings banks will be recalled.

(2.) A group of three lines, with a total trackage of about 37 miles—the Berlin branch, the Hartford & Bristol line, and part of the Nantasket branch—all formerly operated by steam, now operated by the third rail. Taking these lines in reverse order the Nantasket branch (Plymouth Division) has always been the most unsatisfactory of the New Haven Company's electric enterprises. As the original experiment of President Clark, a large but unknown sum was used up in its first stages; and, operated mainly as a summer line, its business has been fitful and its returns irregularly downward. From 1901 to 1902 its number of passengers fell off 24 per cent., receipts 40 per cent., operating expenses about 20 per cent., and the operation of the road has been from the first unprofitable. Electric service on a part of the line has already been discontinued, and, ere long, the whole electric service will probably be dropped. The second member of the group, the Hartford & Bristol line, has been the best of the New Haven Company's third rail

ventures. The last three years for which returns have been published supply the following figures:

	Passengers carried.	Receipts.	Operating expenses.
1900.....	1,204,332	\$141,987	\$51,002
1901.....	1,239,725	146,473	43,233
1902.....	1,350,422	159,240	50,988
Total.....	3,794,479	\$447,700	\$145,223

The low operating cost of about 32 per cent. indicates, even allowing for the additions heretofore referred to, a clean if not a handsome profit. But the line has had a good many changes, notably in its power house; it has had considerable troubles from snow and ice; its third rail has been dangerous to life; and the prospective double tracking of the Highland Division from Bristol to Waterbury to facilitate freight traffic develops a new phase of the problem of "mixed" service. With the future fortunes of the line its short third rail lateral, the Berlin branch and the third member of the group, is practically merged.

(3.) The third group of roads, counting a part of the Nantasket branch already considered, contains about 57 miles of trackage and consists of former steam lines electrified by trolley. In this group the comparatively insignificant New Canaan branch, eight miles long, assimilates itself closely to the "cross country" trolley with results yet to be worked out when the renewal period is reached and with some nice questions of economy as compared with steam operations. For example, whether at the same rate of fare it pays on such a line to carry some 200,000 passengers a year where 100,000 were formerly carried by steam. In the final member of the group, the Providence, Warren & Bristol systems, with 35 miles of trackage and serving large populations (it carried 4,998,314 passengers in 1902) we are again up against an obscure enigma. The electric service on the line represents pretty large original cost, will involve considerable new expenditure, and has a number of times broken down.

Our outline of the situation on the New Haven system shows some of the local complications, and there are others of a more general but not less perplexing character, such as (1) how will the traveling public, once it has "tasted" the benefits of frequent electric car service, view a return to the relative infrequent steam train? (2) With the New Haven company electric service as a completed fact and, to a large degree, a completed investment, how far will such a condition modify the President's policy and procedure? (3) Will he continue in the Connecticut Legislature the long fight of his predecessor against competing electric roads—including long distance lines—or will he drop it? (4) How will he meet new trolley rivalry like that over the New Haven-Derby line just opened, and prospective extensions up the Naugatuck valley? And (5) on his electrical lines, retained or newly acquired, on what mechanical device of operation will he finally rest? The last query, judging from past results, can perhaps be answered by saying that the third rail is likely to be discarded, in favor of an overhead system, or materially modified one. The other four queries cannot be answered now but the replies to them cannot be long deferred.

A prominent New England railroad has this said about it:

"Worcester, Dec. 27.—On account of the wreck of passenger train No. — in this city recently, notices have been posted that all conductors and engineers must take a written examination on the book of rules. Examination papers are being prepared." Most of these conductors and engineers, at least those on the passenger trains, have been running important trains five or ten years, and some of them a much longer time. Examinations were introduced on the Erie and other prominent roads more than 15 years ago. The *Railroad Gazette* has preached them a still longer time. At what period in a conductor's or engineman's career should he be introduced to written examinations?

NEW PUBLICATIONS.

Supplee Mechanical Engineers' Reference Book. 1904. Published by J. P. Lippincott Company, Philadelphia and London. Size 7 in. x 4 1/4 in. x 1 1/4 in., 834 pages, bound in imitation leather. Price \$5.

This book is designed to be a successor to the well-known pocket book written many years ago by the late John W. Nystrom. It follows generally the more recent work of William Kent, published by John Wiley & Sons, but differs from this latter publication in having additions which make it more valuable to the shop manager. Kent seems of equal value in the range of subjects which he covers, but Mr. Supplee has enlarged the sphere of such books by showing more of the cost and methods of using the information given, as well as furnishing information for a designing engineer. Problems are summarized from an economic point of view.

An article on Works Management discusses methods of determining wages to be paid in a shop, the cost keeping and the components of the general expense. A table shows the effects of different rates of depreciation for terms of years ranging from one to 30. Diagrams illustrating the subjects are frequent and make the descriptions readily understood. Sections from the Pencoyd Iron Works showing structural steel, include all common shapes, and the tables list their elements and properties. After each general subject treated, lists of books are given for further reference so that a method is outlined for a more detailed study than a hand book affords.

Subjects treated are: Mathematics, Mechanics, Materials of Engineering, Strength of Materials, Machine

Design, Heat, Air, Water, Fuel, Steam, Steam Boilers, Steam Engines, Internal Combustion Motors, Electric Power, The Cost of Power, and Works Management. The chemical composition of steel is treated quite briefly and little attention is paid to the recent developments in alloys. A thumb index indicates the classification of subjects and makes it physically easy to open the book at quite nearly the right place, while a good index shows where sub-divisions may be found. The book is valuable as the most recent compilation of statistics and information necessary for mechanical work, and as showing the authorities to be used in a further study of each branch.

The Iron and Steel Metallurgist and Metallographist. Published monthly by Sauver & Whiting, Boston. Price, by subscription, \$5 a year; single copies, 50 cents.

The *Metallographist*, of which this new magazine is an outgrowth, needs no introduction to chemists and metallurgists. For six years it has been the foremost exponent of the comparatively new science of metallography, and its volumes are to-day the best reference work on that subject. Its successor, which starts with the January issue, bids fair to attain the same high standard in the broader field of general iron and steel metallurgy. The first number contains one long contributed article on Iron and Steel Alloys by R. A. Hadfield, Manager, Hecla Works, Sheffield, England, and shorter articles by David Baker and Dr. Richard Moldenke, besides a number of articles from the current technical press on metallurgical subjects. The departments include abstracts of leading articles in current periodicals, editorial comments, correspondence, metallurgical notes on iron and steel, financial review, statistics of the iron and steel industry, a review of recent publications, and a brief digest of new patent claims. There are 124 pages of reading matter in the first number and many of the articles are illustrated. It is printed on heavy paper with large type and presents an attractive appearance in every way.

The Polar Planimeter. Its use in Engineering Calculations. By J. Y. Wheatley, C.E. New York: Keuffel & Esser Co., 1903. Cloth, 114 pages and 12 plates. Comparatively few engineers are familiar with the underlying theory of this simple and accurate mechanical aid to difficult calculations, although for many purposes it is in general use. Those who want to know the principles on which the construction of the instrument is based and the many uses to which it may be put in determining the volumes of earthworks, reservoirs and natural basins, in measuring large and small areas and similar operations, will find in this book much interesting reading. The theory is evolved without the use of higher mathematics, in a logical and thorough manner, and the selection of examples of actual determinations with the instrument has been done with a view of presenting typical cases involving all the necessary steps in solving any similar or closely related problem. A brief description of the various forms of simple and precision planimeters and integrating machines, is given in the last chapter.

Railway Signal Association: Proceedings for 1903. New York, 83 Fulton street; H. B. Adams, Secretary.

This volume of the Proceedings contains about 80 pages. This is a slightly smaller number than the issue of last year, the reports of the meetings, other than the annual meeting in November, being more condensed. These earlier meetings had already been reported in pamphlet form. The committees this year are more numerous than before, that on electric circuits having been divided into four separate committees; one for automatic block signals, one for manual, one for interlocking and one special. There are two other new committees; one on definitions and one on office records and accounts. The list of members contains 335 names.

TRADE CATALOGUES.

The Holland Co., Chicago, has issued Circular No. 41, in which the Dake engine is briefly described in principle and sizes and prices given for three types. This is a square piston engine reduced to the simplest elements, there being only two movable pieces, one sliding inside the other and both floating in a square, steam-tight box and guided in their movements by the crank on the end of the driven shaft. The wear on the sliding parts is reduced to a minimum by providing ample bearing surfaces of phosphor-bronze. The engines are made in sizes of from 1 to 20 h.p., and run at speeds of from 800 r.p.m. for the small sizes to 250 r.p.m. for the largest size. Either steam or compressed air may be used, and as they will run in any position they are particularly adapted to running small blowers, centrifugal pumps and dynamos. One type is made to run in one direction only, and another type is made to reverse, which adapts it to use on cranes as described in the *Railroad Gazette*, January 1.

Smooth-On Manufacturing Co., Jersey City, N. J., publishes a small catalogue in which are given numerous examples of the uses of Smooth-On iron cements in repairing and patching cracks and breaks in iron and steel pipes, boilers, castings and for caulking seams and joints. Smooth-On is prepared in the form of a powder which is mixed with water to the desired consistency and applied. When dry the cement becomes very similar in its physical properties to the surrounding metal, having the same coefficient of expansion, the same color and hardness. It is made in four grades for different purposes; one for repairing blemishes and defects in iron castings; one for repairing leaks in steam or hydraulic work, being quick

hardening; one for coating seams on joints of boilers and similar work, applied with a brush, and one for connecting bell-mouth cast-iron pipe in place of the usual lead caulking.

Cincinnati Air and Gas Compressors are described in Pamphlet L-25-A just issued by the Laidlaw-Dunn-Gordon Co., New York. These machines are of medium and small sizes, the steam ends being equipped with plain slide valves and Meyer valve gears and the air ends with poppet valves. One of the compressors is of an entirely new type, the air cylinders being provided both with mechanically moved valves and with poppet valves. All points in the compression cycle are determined by the mechanically moved valves, with the exception of the opening of the exhaust, which is determined by the poppet valves. This arrangement combines the positive action, noiseless operation and durability of mechanically moved valves with the elasticity of poppet valves, at the same time avoiding the noise and rapid wear of the latter.

Catalogue No. 16 of the Bignall & Keeler Manufacturing Company, Edwardsville, Ill., is a neat, flexible-back, cloth-bound volume of 62 pages, describing and illustrating the large line of improved pipe-threading and cutting-off machinery and hand emery surfacers and roller cutters built by this company. The first-named line of machines range in capacity from $\frac{1}{4}$ in. to 24 in., the smaller machines being either for hand or power operation. The

and Dalni, and the cost of keeping a navy on the Pacific coast, he reckons that Russia will be poorer by \$40,000,000 to \$50,000,000 a year because of the railroad. Another Russian journal suggests that the whole Chinese Eastern Railroad be sold to an international combination of Russians, English, Japanese and Americans. The development of the resources of Manchuria would be much more rapid if prosecuted by all these, than if by Russians alone, and in course of time the railroad might be made to pay. The sooner Manchuria can be transformed from a nest of robbers to a civilized country, the better for Russia, even if it does not own it.

An Improved Hydraulic Wheel Press.

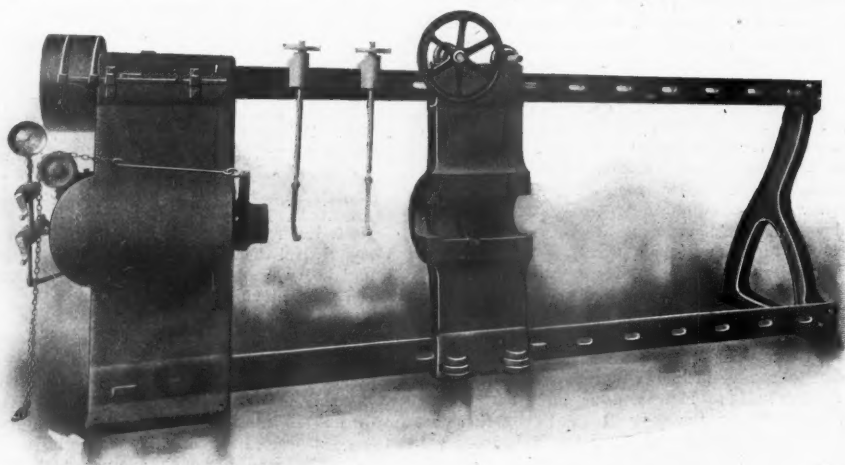
The hydraulic wheel press shown in the accompanying illustration embodies a number of new and valuable features and has been designed primarily to obtain ample strength with simplicity and convenience in operation. To facilitate the handling of heavy work with an overhead crane the top parallel bar is not placed directly over the bottom bar but is set back to make a slight angle with the vertical. Such pieces as locomotive drivers and irregular shaped work which cannot be rolled to and from the press, can be lifted in and out with a degree of ease and rapidity not possible with other forms of presses where the top bar interferes with the direct lift of the crane. The plungers are operated by eccentrics on the back shaft, which is driven by cut gears with

No special foundation is required, as these presses are self-contained and only need a floor strong enough to carry the weight of the press and the work to be handled. An extra valve is furnished to connect with the city water line, when it is convenient to do so, and by opening this valve before turning on the pressure from the pump, the ram is moved out rapidly against the work after which the water line valve is closed and the valve to the pump is opened, giving the full pump pressure. Every press is tested before set up, to a pressure 10 per cent. above the rated pressure, and all of the parts are designed for a 25 per cent. overload. These presses are made in eight regular sizes from a 30-in. 100-ton press up to a 100-in., 300-ton press, the dimension of length being the distance between parallel bars. The smallest size has a single plunger pump, not geared, and has a maximum working pressure of 3,000 lbs. per sq. in. The two largest sizes have triple plunger geared pumps and work under a pressure of 5,000 lbs. per sq. in. Intermediate sizes have double plunger geared pumps working at the same pressure. These machines are made by E. R. Caldwell & Co., Bradford, Pa.

Shops of the Locomotive & Machine Company of Montreal.

A really remarkable record in steel mill building construction was made during the past summer in the erection of these shops, which are located just outside of Montreal. Ground was first broken on May 10 and as it was imperative to have the buildings up and enclosed before the snow began to fall late in October, the work was pushed with energy and resourcefulness not often equaled. Most of the steel used in the buildings was ordered from Europe during the winter and was on hand when work was begun. A temporary frame building was erected for a structural shop and all of the steel work was put together on the ground and erected in place as fast as it could be turned out. Fire destroyed this temporary shop before the work was well under way, and for the rest of the summer the men worked in the open. No strikes or labor troubles of any kind interfered with the progress made on the buildings and by a liberal distribution of bonuses for over time and night work, the seemingly impossible was often accomplished and each stage of the erection followed the other with no delay. Much of the heavier machinery was placed before the buildings were completed and no time was lost in putting everything in running order after the walls were up and the roofs on. Within six months of the time of beginning work, the plant was in full operation in all departments and several locomotives were in the erecting shop in various stages of construction and repair.

The accompanying illustrations are from photographs of the completed shops, taken on November 15. Nine buildings, comprising the plant, are now completed and in use. These include a machine shop 420 ft. x 132 ft., a foundry 220 ft. x 65 ft. 5 in., a boiler shop 380 ft. x 67 ft., an erecting shop 340 ft. x 66 ft., a smith and forge shop 340 ft. x 66 ft., a two-story pattern shop 109 ft. x 63 ft., a pattern store house 109 ft. x 63 ft., a power house 105 ft. x 71 ft., and a general store house and office building. The walls of the buildings are of brick and glass, the large amount of glass used being shown



Hydraulic Wheel Press.

Peerless adjusting mechanism for expanding dies, used on these machines, is described and illustrated in detail. List prices and dimensions of the machines are given.

The Knowles Steam Pump Works 1904 catalogue is a book of 150 pages showing illustrations of different types of direct-acting steam pumps for boiler feeding, mine drainage, water-works service, etc.; also electric and belt-driven pumps, artesian well pumps, air compressors and ammonia pumps, both fly-wheel and direct-acting, jet condensers, relief valves, air and circulating pumps, wrecking pumps, vacuum pumps, sugar-house pumping machinery, etc., etc., covering all types and all purposes in engineering work. This catalogue will be supplied free upon request to those interested.

Automatic Block Signals for Electric Railways.—This is the inscription on Bulletin No. 6, issued by the Pneumatic Signal Company, Rochester, N. Y., briefly describing the "Young System," lately brought out, for the operation of track circuit signals on railroads where the rails of the track are used for the return of the propulsion current. This system was described in the *Railroad Gazette* of December 25. The pamphlet contains, also, illustrations of the Pneumatic Signal Company's electric motor signal and a perspective view of the mechanism for a two-arm signal.

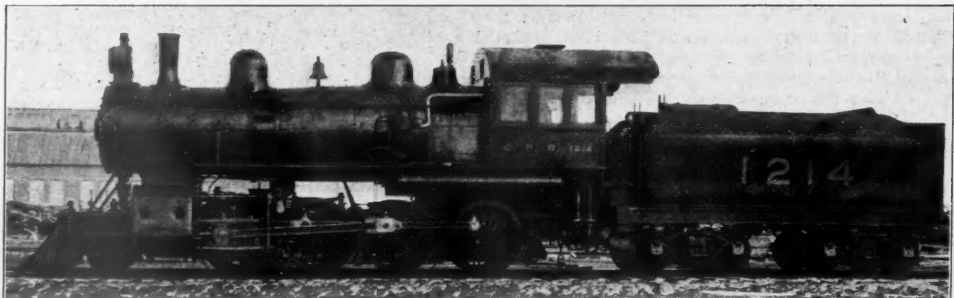
The Mount Vernon Car Manufacturing Company, Mt. Vernon, Ill., is sending out a 1904 year book, vest-pocket size, bound in leather. There are pages for diagrams and memoranda, personal cash account by months, addresses, a diary, the Diamond atlas of the U. S. and useful information.

While some journals of western Europe will have it that Russia is so well pleased with its Siberian Railroad that it is preparing to build another across the desert of Gobi to Peking, some of the Russian journals say that it would be better off without the Chinese end of the railroad already built. A writer in what is perhaps the leading Russian newspaper affirms that the expenses of this road will be \$4,000,000 to \$5,000,000 more than its gross earnings; that the maintenance of steam navigation on the Amoor in connection with the railroad nets a loss of about \$1,000,000 a year; that interest on the capital invested will amount to \$7,500,000 to \$10,000,000, and the military protection of the road will cost \$5,000,000 to \$7,500,000—altogether \$17,500,000 to \$22,500,000 a year just to keep the railroad going. Adding the expenditures for improving the road, for building and maintaining the Pacific ports at Port Arthur

a ratio of $3\frac{1}{2}$ to 1, from a counter shaft with tight and loose pulley, mounted on the back of the ram head. The plungers work in cylinders mounted on the base of the ram head from which the pressure pipe leads into the back of the ram. A pressure gage which may be cut out by a valve placed just below it, is attached to the pipe and records in tons and lbs. per sq. in. the pressure exerted in making any desired degree of tight fit. The plungers are packed with leather rings of such construc-



General View of the Shops of the Locomotive & Machine Co., of Montreal.

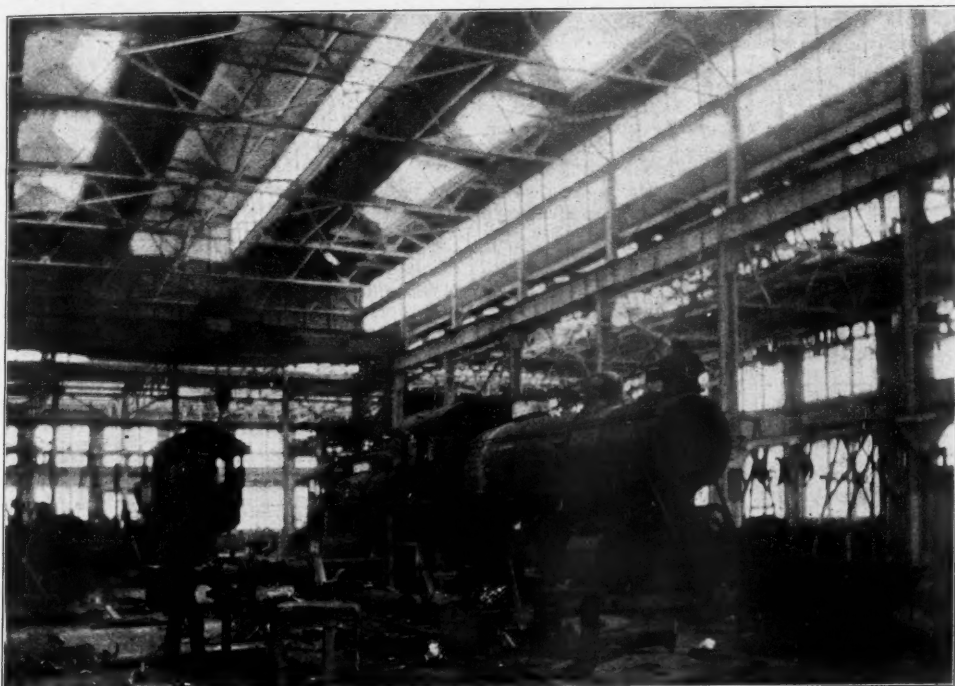


First Locomotive Built by the Locomotive & Machine Co., of Montreal.

tion that they pack absolutely tight under any pressure but allow the free movement of the plungers without excessive friction. The ram is faced with hardened steel and steel shoes are furnished for the face of the sliding head. A special mixture of close grained iron is used in casting the cylinders, which gives them great strength and makes them tight against leakage. The ram is packed with "U" hydraulic packing, which is easily removable after withdrawing the ram from the cylinder. By means of a counterweight and chain passing over a pulley on the fixed head, the ram is automatically drawn back when the pressure is released.

in the exterior view. For a complete description of the shops and some of the important tools installed the reader is referred to the *Railroad Gazette*, Aug. 21, and Sept. 25, 1903.

During the summer while the permanent buildings were going up, a temporary locomotive shop was put in operation to fill some repair orders which had been received. An engine which was entirely rebuilt was turned out in September and other repair work was in hand when the new shop was opened. Up to the first of the year the company had completed one new switch engine and one 10-wheel engine, a photograph of which is shown and had



Interior of Erecting Shop, Locomotive & Machine Co., of Montreal.

rebuilt from the ground up, four road locomotives for the Canadian Pacific and one six-wheel switcher. Besides these orders, four locomotive boilers have been built and numerous other miscellaneous jobs, including one structural steel contract for \$20,000. This is an excellent beginning, and the prospects for the coming year as indicated by orders on hand are very bright.

Report of the New York Railroad Commissioners.

The New York State Railroad Commissioners, Messrs. George W. Dunn, F. M. Baker and J. M. Dickey, have issued the advance sheets of their annual report for the year ending June 30, 1903. As usual, the traffic and earnings of the railroads are reported, but as the figures include thousands of miles outside the State we do not quote them. The figures relative to traffic on the electric roads of the State are of unusual interest this year as illustrating the working out of some of the difficulties caused by over-capitalization, and shown particularly by certain lines in the vicinity of Albany. The total figures of assets, capital liabilities, earnings and expenses of the electric properties throughout the State serve as a reminder of the extremely rapid growth of electric lines within the last few years. The Railroad Commission seems to take no attitude toward the prevalent over-capitalization except that of a not particularly interested bystander; which is in contrast to the careful and watchful method of limiting capital liabilities in accordance with the "fair value of replacement" method of the Massachusetts Commission. Capital stock issued increased during the year from \$204,591,357 to \$218,051,060, and the funded debt increased from \$218,508,474 to \$230,882,923. Total gross earnings of the electric lines (including the Brooklyn elevated) increased from \$46,905,138 to \$48,974,749, while total operating expenses increased from \$27,629,865 to \$28,259,721, leaving an increase of about 1½ millions in net earnings. The electric roads in the State, including, as previously said, the Brooklyn elevated, carried 1,267,563,000 passengers during the year. The total capital stock per mile of road for the street railroads is over

\$115,000, and the total funded debt per mile is \$121,850. A table showing the average earnings per passenger in cents and the average cost of operation per passenger, based on gross earnings from operation and operation expenses only, shows that all of the principal companies in the State, except the Hudson Valley and the New York & Long Island, made a nominal profit, but a second table, in

which average of all receipts per passenger is compared with the average expense per passenger, pro-rating fixed charges, shows a number of lines in difficulty, the most striking example being the Hudson Valley, which seems to have spent 14.33 cents on each passenger carried in return for 9.7 cents received.

Comment was made in the *Railroad Gazette* June 30 last, on the entirely inadequate means which were being taken to get rid of highway crossings of railroads at grade in New York. This matter is again brought into prominence with the present report of the commissioners because this is the second consecutive year when no appropriation whatever has been made by the State, except \$5,000 in 1902 and \$7,500 in 1903 for "expenses." From 1898 to 1901, inclusive, the total appropriations aggregated only \$367,500, or a trifle over \$90,000 yearly.

Railway Signal Association.

The meeting of this association, which was held in New York on Tuesday of this week, was presided over by Mr. Lawrence Griffith, the Vice-President. It was well attended, and profitable informal discussions were held. The proposition to amend the By-Laws of the association so that two or three of the meetings of each year may be omitted, at the option of the executive committee, which was mentioned in the call for the meeting and which will come up for action at the regular meeting of the association, was briefly discussed, and there was a large majority against it. The sentiment appeared to be in favor of making all but one or two of the meetings informal, and the majority appeared to agree with the proposers of the



Interior of Machine Shop, Locomotive & Machine Co., of Montreal.

change, to the extent that the less formal meetings could profitably be made somewhat local in their nature; but the majority—all eastern men—were decidedly in favor of assembling four or five times a year; such gatherings to be in New York, except at such times as the business shall be of such importance as to demand a national meeting. A resolution was passed to the effect that there is no objection to changing the date of the annual meeting from November to October.

The first discussion was on the best means of keeping interlocking plants working satisfactorily in severe snow storms. The first point made was that all the men available to clean ground connections with brooms should be promptly on hand at the beginning of a storm. Aside from this, the question most discussed was the relative merits of kerosene oil, black oil and salt. Where thick ice had formed, Mr. Morrison, of the Erie, had successfully used hot brine. Mr. Vernon, of the New Haven, uses kerosene oil just before he expects severe frosts. He had had no trouble with detector bars freezing, except where water was dropped on them from locomotives. Mr. Wiegand said that on elevated structures, where salt is particularly objectionable, a solution which had been found satisfactory was made up of one gallon kerosene oil, one quart black oil and one pound rock salt. Mr. Ten Eyck in many cases preferred kerosene oil to salt, as it would keep snow soft and would not draw frost from rails. Mr. Griffith digs out spaces between ties at the beginning of winter, thus improving the drainage and making it easier to get snow out of the way. He finds salt of little service when the temperature goes below 27 deg. F. Mr. Kenly had found more trouble after a storm than during its continuance, especially when the snow was not dry. After the weather clears and the days are warm and the nights cold, care must be taken not to let rod connections freeze. Ice on the rods will break guide wheels.

Mr. Vernon is now putting boxing on his pipe lines everywhere, though he finds less need for this on his northern lines in the coldest climates than near Long



Interior of Boiler Shop, Locomotive & Machine Co., of Montreal.

Island Sound. The objections to boxing were discussed. Rods deteriorate faster when covered and inspection is more difficult. All boxing should be taken off periodically. As boxing is a hindrance to good maintenance, but is by most superintendents deemed necessary for protection against snow, it was suggested that boxing might be used in winter and removed in summer.

The discussion on the proposition to use two lights for important signals so as to distinguish them from those less important, which had been laid before the association in a communication from Mr. F. A. Delano, General Manager of the Chicago, Burlington & Quincy, brought out a desultory discussion on lights in general and on the Chicago & North Western practice; in which, however, the double light is used only where it is desired to show two colors. The C. & N. W. lamp for distant signals costs about \$2 more than the ordinary lamp and is a bulky thing to handle. The first point on which Mr. Delano's proposition was objected to was that for twin lights, both of the same color, two spectacles would be necessary, or one very large one, which would be difficult to design. The Central of New Jersey uses two (red) lights side by side for a train order signal. The meeting appeared to be agreed that where the signal for the highest speed route is always at the top of the post the situation of the light on the post is sufficient to indicate its importance, as compared with other lights on the same post, and no additional means of distinguishing it is necessary; but it was suggested that perhaps on roads where the rule still prevails to have the upper light indicate the extreme right and the lower the extreme left, thus bringing the high speed light, in some cases, in the middle or at the bottom of the row of lights, some way of distinguishing might be necessary. It was suggested that a distinction could be made by having a single lamp of great intensity and a large accurately ground lens, such as is used in the Fourth avenue tunnel, New York City, but as these large lamps are very costly, this proposition was quickly dropped.

On the New York Central a blue light is used for the stop indication in dwarf signals, and it shows well for 600 ft. to 800 ft. Reference was made to the practice of the Pennsylvania Lines West of Pittsburgh, where the finding of lights by the engineer is facilitated by having two lights on every post (except in the case of starting signals) even if there be no diverging route. The second light is about 6 ft. below, the same as for a diverging route. Mr. Vernon favored this, but only for night indications. On a post where but one signal is needed he would have a second light, but no second arm. On a distant signal post with but one arm he would have the lower light uncolored, and show a letter *D* on a translucent ground. The discussion was closed by a vote, which as carried by a large majority, that it was the sense of the meeting that nothing more than a single red light is required for the night stop indication in a semaphore signal.

Possibilities of Alternating Current Single Phase Railroad Motors.*

With the commercial development of the alternating current motor, new possibilities are introduced in electric railroading, owing to the much higher voltages for which the motor itself can be wound, and due also to the fact that alternating current is used directly as motive power without the expensive transforming apparatus required for the direct current series motor.

The alternating three phase induction motor has been applied to traction work with doubtful success, owing to its practically synchronous characteristics, its limited output making it sensitive to the heavy voltage drops liable to occur in railroad work, and due, furthermore, to the complication of double overhead trolley required for this type of motor.

During the past few years there have been developed several types of single phase alternating current motors having speed-torque characteristics even better adapted for railroad work than that of the direct current series motor, and, furthermore, providing ample starting torque with any voltage variation liable to occur in practical operation. As these motors can be operated with a single trolley and ground return, and can, furthermore, be operated satisfactorily on either direct or alternating current, it makes their field of usefulness much greater than their direct current series competitor.

Having such a matter with practically no restriction as to voltage, it is possible to break away from the exclusive field of electric traction with frequent service and small units and consider the operation of freight and passenger trains over our regular steam lines. In order to arrive at some general conclusions not limited by the local considerations of a specific case, this paper is devoted to a somewhat brief and general discussion of the operation of our steam lines by the alternating current motor.

To make the conclusions general, trains of different weight have been taken, operating at different speeds and varying headway over a level track. As being typical, train weights of 2,000, 1,000, 500 and 250 tons of 2,000 lbs. have been selected. As the investigation of the operation of these trains will be carried to maximum speeds of 60 to 70 m.p.h., the total friction of the train expressed in pounds per ton is given in Fig. 1. This friction is not that of the trailing load, but includes the running and wind friction of the locomotive itself.

From a number of tests a steam consumption of approximately 30 lbs. per i.h.p. hour is taken as the basis of all locomotive work. It is assumed that locomotives are com-

pound, as this steam consumption could hardly be expected with simple engines under average conditions. To make all results comparable further assumptions are made of an evaporation of 7 lbs. of water per pound of coal, an engine efficiency of 85 per cent., and cost of coal at \$2.00 per ton of 2,240 lbs. The price of fuel will vary and this is considered later. As we are figuring upon actual performance of the locomotive, that is work done in overcoming train friction, it will be necessary to introduce a factor allowing for coal wasted in making up and damping fires, and general waste incident to locomotive prac-

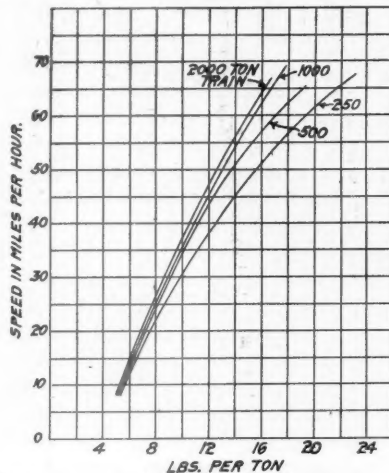


Fig. 1—Train Friction Curves.

tice when standing idle for a large part of the 24 hours. Furthermore, a steam locomotive is called upon to operate throughout the year at varying temperatures of the surrounding air, and coal consumption during the winter months is in excess of that during the summer. This excess may reach 20 per cent, as an average during the cold weather, and hence 10 per cent, additional fuel is charged to the locomotive for the work assumed, to take care of the different conditions of operation which the electric locomotive does not have to contend with.

On the basis of the above assumptions, all of which are the result of practical tests, Fig. 2 is obtained:

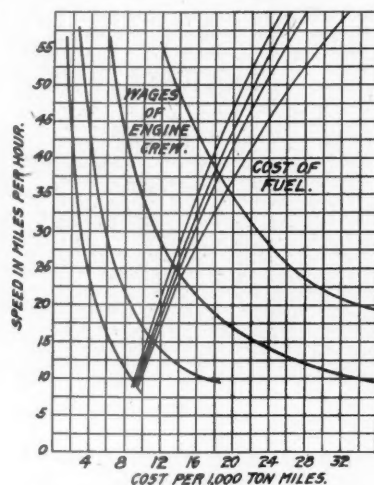


Fig. 2—Cost of Steam Operation with Coal at \$2 Per Long Ton.

These figures check up reasonably close with the locomotive performance sheets for steam roads after superfluous mileage has been deducted from the total mileage given. As an example the shifting locomotives and pushers are charged with so many miles per hour and often do not make one-third the mileage charged to them, so that locomotive performance sheets, as published, some times indicate too low a coal consumption per 1,000 ton miles of actual work done.

The next item of considerable expense in steam operation is the labor account. As it is immaterial to the train crew whether steam or electric locomotives are supplied, this item will not be considered. The engineer and fireman, however, are greatly influenced by the character of the motive power. In steam operation a crew working 10 hours a day average for the railroad company will not be in actual service on the road more than 40 or 50 per cent, of the time, the remainder of the time being taken up in caring for the locomotive. In electrical operation the full time of the crew can be utilized for active duty, and hence a considerable saving effected in this item. In steam operation a crew costing \$8.50 for 10 hours labor has been assumed to be in active commission for five hours per day, while in electric service the crew is assumed to be in commission 8.3 hours per day out of the 10. For shorter hours of labor the same proportion would hold true, and the crew for the electric locomotive will cost but 60 per cent, of that for the steam locomotive.

In order to approximate the repairs on steam locomotives of different capacities, it is assumed that the locomotive will have its weight proportioned to the trains which it is to handle and as a basis of the repair item, the following values are assumed, agreeing closely with the results of compound locomotives in actual service.

Steam Operation—Repairs, Cents per 1,000 Ton Miles.	
250 tons	25
500 tons	13.8
1,000 tons	7.7
2,000 tons	3.3

The items of oil, waste and water are not determined here at length, but are introduced in the final values obtained for operating expense. Combining the figures obtained above for steam operation, including fuel at \$2.00 per 2,240 lbs., engine crew at \$8.50 per 10 hours (five of which are in actual service), repairs, oil, waste, water, etc., the results in Fig. 3 are obtained.

It is evident from the curves that each weight train can be run at a certain speed with a minimum expense for operation, this speed varying with the weight of the train. This economical speed will, of course, vary with any variation of the constants assumed above, such as

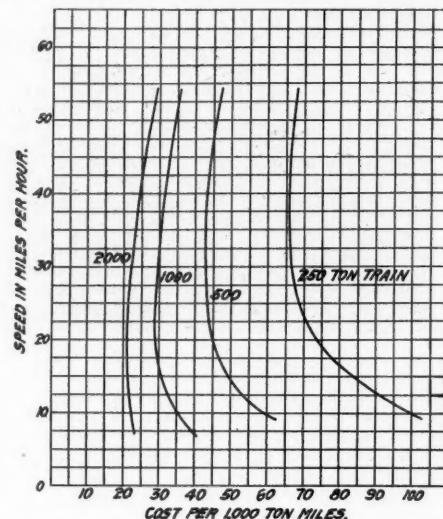


Fig. 3—Cost of Steam Operation with Coal at \$2 Per Long Ton.

the price of coal, labor, etc., but the values obtained are instructive and are given below:

Speeds of Economical Operation.	
250 tons	38 m.p.h.
500 tons	28 "
1,000 tons	23 "
2,000 tons	19 "

Considerable latitude is given above and below these speeds without greatly increasing expenses per 1,000 ton miles for operation.

Coming now to the determination of the cost of operating an electrically propelled train under the same conditions, we arrive at some very interesting results due to the low first cost of electrically equipping the proposed steam line afforded by the alternating current single phase motor.

The same friction values are used as given in Fig. 1 for steam operation. From these values the kilowatt capacity of each train is determined for the different speeds and varying weights of trains. From these values the cost of trolley copper, step down line transformers and generating station are determined. The electrical system consists, in brief, of a generating station controlling 100 miles of track, that is, feeding 50 miles in either direction. At intervals of approximately 12 miles are installed step down transformers reducing the transmission potential to 3,000 volts or more for the trolley potential. This trolley potential is assumed at 3,000 volts for a majority of the results, but for heavy work, that is 1,000 and 2,000 ton miles the voltage is somewhat increased, but no-

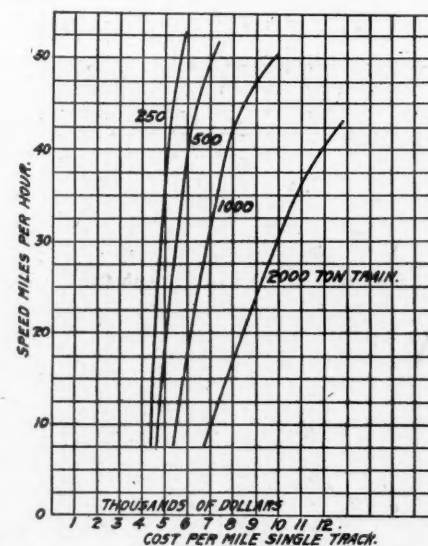


Fig. 4—Cost of Electric Installation—Ten Trains Each Way Per Day.

where exceeds a safe operating value. The transmission potentials also are kept entirely within practical limits. The generating station does not get excessively large and the electrical system throughout presents no features of unusual interest, but rather duplicates work that is being

*Abstract of a paper by Mr. A. H. Armstrong, read before the Canadian Society of Civil Engineers, Nov. 16, 1903.

done throughout the country. By keeping all values within conservative limits, the results obtained become of practical application and not of theoretical interest.

The cost of installing the electric system complete, including generating station, transformer sub-stations, transmission line, poles, bonding of track, etc., is given in the following table:

Cost of Electrical Installation per Mile of Single Track.

M.P.H.	2,000 Ton Train.		
	5 trains each way.	10 trains each way.	20 trains each way.
10	5,600	7,020	9,860
20	6,520	8,490	12,430
30	8,510	9,840	14,580
40	11,690	11,910	16,770
M.P.H.	1,000 Ton Train.		
	5 trains each way.	10 trains each way.	20 trains each way.
10	4,800	5,500	6,920
20	5,200	6,200	8,100
30	6,250	6,900	9,400
40	7,600	7,700	10,600
50	9,820	9,820	12,700
M.P.H.	500 Ton Train.		
	5 trains each way.	10 trains each way.	20 trains each way.
10	4,400	4,700	5,400
20	4,500	5,100	6,000
30	5,100	5,500	6,800
40	5,900	6,000	7,500
50	7,100	7,100	8,600
M.P.H.	250 Ton Train.		
	5 trains each way.	10 trains each way.	20 trains each way.
10	4,200	4,400	4,800
20	4,300	4,600	5,000
30	4,600	4,800	5,400
40	5,100	5,200	6,000
50	5,700	5,700	6,600

The above tables are given at length as they form very interesting reading, showing how the cost increases with the size of the unit rather than by the frequency of trains. Also it is very necessary to arrive at an initial cost of electrical installation somewhat accurately as this constitutes a funded debt upon which the saving, if any, between electrical and steam operation must pay dividends.

In determining the cost of electrical operation it has been necessary to consider the cost of producing power, and a sliding scale has been taken for the different kilowatt outputs, ranging from four mills per k.w. hour to nine or more, with coal at \$2.00 per ton, depending upon the k.w. capacity of the generating station. It is assumed that steam turbines and modern methods of generating station construction are used, looking to the greatest economy of operation. Wages of engine crew, as stated, are taken at 60 per cent. of those for steam operation. Repairs for electrical locomotives are given in the following table.

Electrical Locomotive Repairs.

250 tons.....	8 cents per 1,000 ton mile.
500 tons.....	4.8 cents per 1,000 ton mile.
1,000 tons.....	2.3 cents per 1,000 ton mile.
2,000 tons.....	1 cent per 1,000 ton mile.

These repairs, in common with that given for steam operation, include all running repairs, overhauling and renewals. The cost of electrical operation is given complete in Fig. 5, which are directly comparable to the cost of operation for steam previously given. It is obvious that as there is a fixed charge of 5 per cent. depreciation

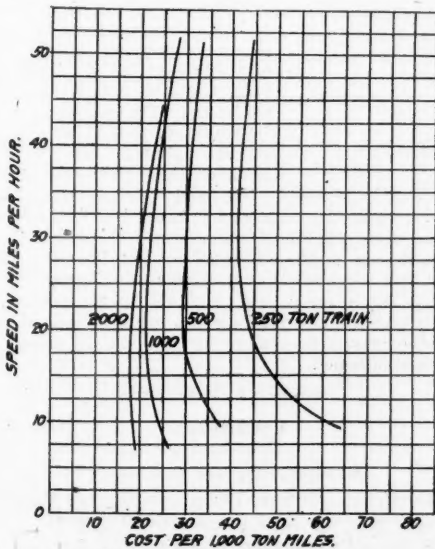


Fig. 5—Cost of Electric Operation with Coal at \$2 Per Long Ton.

and repair account on the entire electrical installation, it is necessary to consider the frequency of travel over our proposed route. In order to make it as general as possible, it has been assumed that there will be 5, 10 and 20 trains per day each way. The cost of operation expressed in cents per 1,000 ton mile does not vary greatly with the different frequency of trains, but the dividend account must be based upon a selected train frequency. For convenience, a train frequency of 10 per day each way is taken, and the cost of electrical operation given. For other frequency of trains, the cost of operation per 1,000 ton miles will not vary more than one or two cents either way from the results given in the curves and they are, therefore, of fairly general application.

By comparing this curve with that given for steam operation, a considerable saving is shown, giving varying dividends depending upon the frequency of travel, weight

of train, maximum speed, etc. In fact, frequency of travel and weight of trains are the determining features in considering the adoption of electric transportation. In order to show the dividend earning power, that is the saving in electric operation over steam as the percentage of the cost for electrical installation, the three following tables have been prepared for a frequency of train service of 5, 10 and 20 trains each way per day.

Interest on Electrical Investment, Five Trains per Day Each Way.

M.P.H.	2,000 tons.	1,000 tons.	500 tons.	250 tons.
10	5.75	8.17	9.25	9.22
20	3.88	4.92	5.73	6.02
30	1.81	3.82	4.1	4.85
40	...	3.47	3.68	4.07
50	...	...	3.36	3.74
Ten Trains per Day Each Way.				
10	8.48	14.8	17.5	18.3
20	4.68	8.87	11.05	11.9
30	1.31	7.2	8.1	9.65
40	...	6.8	7.62	8.14
50	...	...	6.72	7.48
Twenty Trains per Day Each Way.				
10	8.92	23.1	31.4	34.5
20	2.6	12.9	19.1	22.1
30	...	9.8	13.65	17.8
40	...	9.73	12.8	15.0
50	...	...	11.25	13.7

As shown by the above tables, electric locomotives cannot compete with steam for trains of 2,000 tons at higher speeds, owing to the enormous cost of equipping the road electrically with the constants chosen. Should such heavy

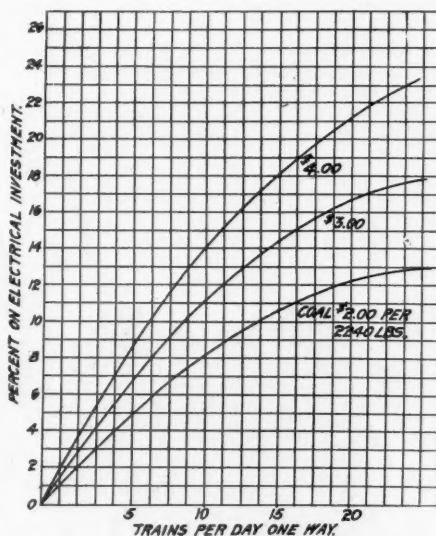


Fig. 6—Net Earnings of Electric Installation—1,000 Ton Train Units.

railroading be contemplated electrically, it would be necessary to adopt longer transmissions than 50 miles either way from the power house. Higher voltages should also be used on the trolley. The scope of the paper has been limited, however, to the use of standard apparatus and voltages met with in every day practice. The results given thus represent the practice of to-day and not what electrical engineers may be able to do some time in the future. The consideration of the operation of 2,000 ton trains at speeds of 50 or 60 m.p.h. is hypothetical as no steam locomotive could be constructed that would furnish sufficient power to haul a train of this weight at the speeds considered. The problem is feasible from an electrical standpoint as the weight of the locomotive could be distributed among a number of units distributed throughout the train to lessen the drawbar pull without exceeding a permissible weight per axle.

The discussion of the paper has been limited thus far to the use of coal costing \$2.00 per ton for both steam and electric locomotive work. It is a well known fact that generating stations can use cheaper coal than it is economical to use on steam locomotives, and hence it is interesting to follow through the results with varying prices of coal. In figuring the cost of coal, it is assumed that coal will be charged to operation at the price for which it could be sold in the wholesale market at the locality used. Coal at \$2.00 per ton is somewhat cheap, especially for some of the western roads, and the same method of figuring has been used in determining the earning capacity of the electrical installation for \$3.00 and \$4.00 coal as well. As the saving in electrical operation and its percentage of the cost of installing the electrical system are of fundamental importance, the tables for interest earning capacity expressed as percentage of the electrical installation is given in the following tables both for \$3.00 and \$4.00 coal.

Coal at \$3 per 2,240 Lbs.—Interest on Electrical Investment.

Five Trains per Day Each Way.				
M.P.H.	2,000 tons.	1,000 tons.	500 tons.	250 tons.
10	8.35	10.6	10.8	9.6
20	6.77	6.8	6.9	6.4
30	4.35	5.8	4.85	5.02
40	8.12	5.5	4.94	5.0
50	...	...	4.7	4.67
Ten Trains per Day Each Way.				
10	12.8	17.7	19.5	19.4
20	8.77	12.1	13.2	13.0
30	7.3	10.75	10.0	11.1
40	6.0	10.75	10.47	10.3
50	...	...	9.4	9.34

Twenty Trains per Day Each Way.

10	14.9	27.8	38.4	36.3
20	8.2	17.7	22.6	23.8
30	7.9	15.0	17.0	20.1
40	6.25	15.2	17.3	18.1
50	...	...	20.4	16.9

Coal at \$4 per 2,240 Lbs.—Interest on Electrical Investment.

Five Trains per Day Each Way.				
M.P.H.	2,000 tons.	1,000 tons.	500 tons.	250 tons.
10	11.0	11.65	11.6	10.2
20	9.65	8.65	8.15	7.19
30	7.04	7.74	6.35	5.72
40	5.64	7.54	6.2	5.75
50	...	...	6.13	5.6
Ten Trains per Day Each Way.				
10	16.8	20.8	21.4	20.4
20	13.4	15.2	15.8	14.7
30	12.0	14.3	12.2	12.7
40	10.72	15.0	12.8	11.8
50	...	...	12.2	11.2
Twenty Trains per Day Each Way.				
10	21.1	33.2	38.4	38.0
20	14.8	22.9	27.4	25.6
30	16.8	20.3	20.3	22.6
40	12.4	20.9	21.1	20.7
50	...	...	20.4	20.1

A study of the above tables brings out the fact that for infrequent service, that is five trains per day each way or less, it would hardly pay to equip the road electrically, there being a dividend of from 4 to 7 per cent. on the capital invested. With more frequent service, however, the saving in electrical operation becomes more marked until at from 15 to 20 trains per day each way, the interest earning power of the electrical investment is worthy of very careful consideration. It should be borne in mind that all these figures do not contemplate increase in the present traffic of the road, and, therefore, do not take into consideration one of the chief characteristics of electric traction, that is developing short haul local traffic and thus increasing the dividends by increasing the receipts rather than by cutting down operating expenses. The well known ability of electric roads to greatly increase previous steam traffic has led them to be installed, in many cases, without too close an investigation into their economical installation. Taking into account therefore that the electrically equipped road, while caring for the heavy through freight traffic with an earning capacity of from 4 to 7 per cent. on the investment, can also build up a local traffic both freight and passenger, with practically no additional cost and showing very large returns.

Taking up the possibilities of the alternating motor in general haul work, the problem had to be treated in a very general way in order not to lose sight of the scope of the problem in considering local details. The average specific problem has its local conditions, which must be carefully considered in detail, and, in many cases, would show a greater return for the money invested than indicated in this paper. For instance, all power is supposed to be generated from coal from power house devoted to the interests of railroading alone. Along many of our roads exist water power facilities which could be advantageously developed and furnish power much cheaper than the figures assumed from coal generation. Further-

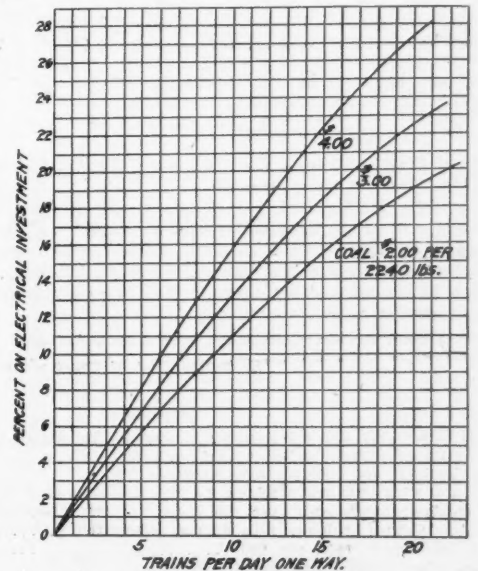


Fig. 7—Net Earnings of Electric Installation—500 Ton Train Units.

more, the cost of power in the smaller generating station capacity has been assumed as high as 1 cent per kilowatt hour or more, and should a generating station supply other industries, such as mining, lighting, general power distribution, etc., the cost of purchasing power would be considerably decreased with a consequent reduction in cost of operating electrically. The results given in the table therefore are of general application only and may be considerably modified when considering the local aspect of a given proposition. It is believed, however, that the results as obtained are based upon conservative assumptions, in fact, most of these assumptions were obtained from operating conditions, and, with the figures given, outline somewhat briefly the possibilities of the alternating current single phase motor in the railroad field.

The operating expenses considered include fuel, wages,

repairs, oil, waste, water, and 5 per cent. depreciation on the electrical installation. No depreciation is charged off against the locomotives, as although the electric locomotives cost more than the steam, they will permit of a greater mileage, so that the total capital invested in locomotives should be practically the same in either case. There are a number of expenses incidental to steam operation other than those considered which must be done away with with the adoption of the electric locomotive. While each of these expenses is small they may amount to considerable in the aggregate. For example, the electric locomotive is double ended and requires no turn-table. Two electric locomotives can be coupled together and operated by one engineer in the cab of the leading locomotive, each locomotive doing an equal share in hauling the train. In fact, it is not strictly necessary to consider the use of a fireman in electric propulsion, as his duties will be largely confined to ringing the bell, and waiting for the engineer to die of heart disease. His services can be dispensed with entirely if we consider that the electric locomotive cab can be made the caboose for the train, and the train crew serve as a reserve for the engineer in case of trouble. The cost of fuel has been assumed equal in both cases, but there is an added expense in handling the fuel for steam operation as the source of supply of the locomotives is distributed in small pockets over considerable track, each pocket requiring more or less outlay for its establishment and maintenance, all of which can be saved by electric locomotive fed from a central generating station. The increasing tendency towards the adoption of very heavy trains calls for heavier locomotives with consequent increase in weight of rail, cost of bridges, ballasting track, and general maintenance of the right of way. Indeed, the wear upon a light rail with a heavy reciprocating engine must be considerably more than that given to the rail by an electric locomotive of half the weight and having a perfectly uniform rotary impulse imparted to the drivers. Just how much money may be saved by the lessened maintenance of the track is conjectural and hence has not been entered into here, but the figure must reach a considerable size for heavy locomotive work. As the maintenance of electric locomotives is considerably less than its steam competitor it will reduce the size of repair shops required, the difference in the interest on which should appear as a fixed charge against steam operation. Furthermore, a steam locomotive including a tender has not more than 50 per cent. of its weight upon the drivers, which will constitute from 7 to 10 per cent. of the average train weight. As this is a dead weight, producing no revenue, it would be fair to compare the two systems by estimating upon a train for steam operation from 7 to 10 per cent. heavier than for electric operation. The comparative figures given in the table based upon 1,000 ton miles are not, therefore, entirely fair toward electric operation, but should be somewhat increased for haulage involving the use of the steam locomotive.

The earning capacity of the money invested in electric equipment can be looked upon, therefore, as exceeding the values given in the tables, but as stated above, local conditions will largely affect the application of the general figures to any given example. Should all the factors entering into the engineering expense of operating roads by steam and by electric locomotives be carefully considered, the possibilities opened up by the use of the alternating motor are sufficiently great to warrant its replacing the steam locomotive in many of our railroad systems, either in part or for the complete system.

Cost of Electric Railroad Construction in Great Britain.

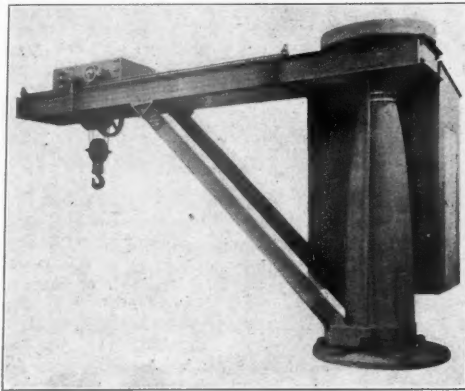
The following itemized cost of construction of electric tramways in Great Britain, per mile of single track, is given in an appendix to a paper by Robert Bruce, read before the Manchester Association of Students. The costs, which in the original are given in British money, have been converted to dollars and cents.

Estimated Cost of Construction of Single-Track Electric Tramways.

Description.	Quantity.	Rate.	Amount.
Steel girder rails, 6½ x 6½ in., 60 ft. long, 95 lbs. per yd., per ton.....	150	\$32.80	\$4,920.00
172 pairs fish-plates, 50 lbs. per pair, per ton.....	3.84	34.055	130.76
2½ lbs. bolts and nuts for fish-plates, per ton.....	1.04	82.01	85.29
Tie-bars, with nuts and washers, 14 lbs. each, spaced 7 ft. 6 in. center to center (notched at one end), per ton.....	4.4	48.65	214.06
Steel sole-plates at joints with fixings, each.....	172	2.187	376.55
60½-in. copper bonds, per 100.....	26	97.30	25.30
35-in. copper-joint bonds, per 100.....	344	64.40	221.53
Lifting, cleaning, carting and stacking separately old sets, average distance not exceeding 1 mile, per sq. yd.....	4,700	0.183	860.10
Excavation carted away, per cu. yd.....	915	0.486	446.69
Portland-cement concrete foundation 6 in. deep, per cu. yd.....	785	4.374	3,436.92
Laying tramway, including moving metals into position, fixing, gaging, leveling, packing and bedding rails, etc., per lineal yd.....	1,760	0.486	856.24
Supplying and fixing temporary iron gage-rods.....	.....	.....	24.33
Fixing and painting bonds, each.....	370	0.243	90.00
Paving with new granite sets, 6 in. deep, bedded on sand, racking with granite chippings, and covering off with ¼ in. of sand after being grouted, per sq. yd.....	4,360	2.43	10,615.70
Tusking and coursing sets alongside of track, per lineal yd.....	3,520	0.122	429.44
Grouting joints of sets with pitch bitumen, per sq. yd.....	4,360	0.243	1,061.57
Packing spaces between each side of rail and sets with granite chippings, and grouting with pitch bitumen, per lineal yd. of rail.....	3,520	0.122	429.44
Fencing, watching and lighting.....	.....	.....	291.96
Taking delivery of materials and watching and lighting same.....	.....	.....	486.60
Adjusting manholes, lampholes, restoring mains, water and gas pipes, etc.....	.....	.....	243.30
Protection from weather, tarpaulins, etc.....	.....	.....	48.65
Removing surplus and waste materials.....	.....	.....	97.30
Total.....	.....	.....	\$25,391.73

Electric Pillar Jib Crane.

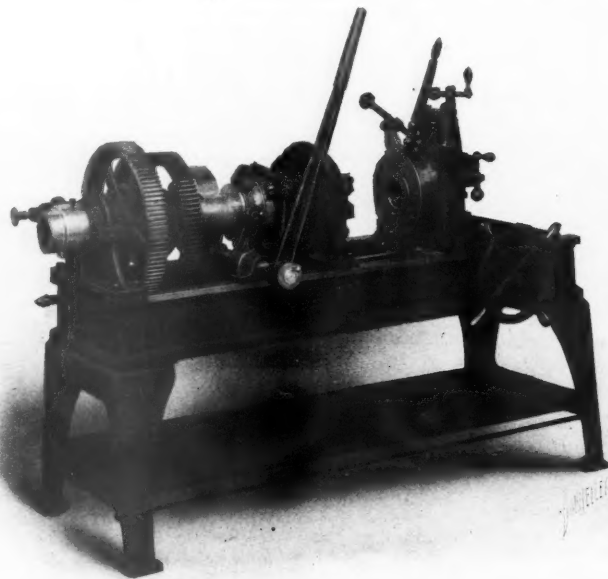
The crane shown in the engraving is intended primarily for use in handling and transferring freight, being an improvement on the usual hand-power crane for such work. It is electrically operated, separate motors being used for hoisting and swinging. The controllers and other governing mechanism are located in the cab on the side of the pillar. The swinging motor is also in this



Electric Pillar Jib Crane.

cab, near the top of the pillar. The hoisting mechanism has an automatic limit stop, and also automatic electric and mechanical brakes. The trolley is enclosed in a steel box for protection from the weather, and the swinging gear is likewise protected.

The cranes are made in sizes of from two to 10 tons capacity with usual radii of from 15 ft. to 20 ft. They



Improved Pipe-Threading and Cutting-Off Machine.

are self-supporting, no guys being used. The hoisting speed is 10 to 25 f.p.m., and the swinging speed 4 to 5 r.p.m. Anti-friction roller bearings are provided at the top and bottom of the pillar. The gearing is all cut. The Northern Engineering Works, Detroit, Mich., are the designers and builders.

Improved Pipe-Threading and Cutting-Off Machine.

A pipe-threading and cutting-off machine, designed primarily for use in car shops, tube mills and supply houses, and capable of threading rapidly large quantities of pipe of one size, is shown in the engraving. Strength, durability, speed and convenience are claimed for the tool. It may be used either for cutting and threading nipples or as a regular pipe machine. Adjustments are easily and quickly made, and in cutting and threading pipe an entire lot of one size may be run through without stopping the machine, this being possible through the use of lever-gripping and expanding-die mechanisms.

The parts of the gripping chuck are substantially made, to withstand severe usage. The chuck arms, or levers, are solid castings of one piece, pivoted on case-hardened pins, and have steel rollers in their outer ends to reduce friction in operating. The outer, or long, ends of the levers are connected by tempered steel expansion springs which draw the jaws away from the pipe when the lever is thrown back. The chuck jaws, which are made of tempered steel, are held in T slots in the short ends of the levers and are adjusted by means of case-hardened screws.

It is as a nipple cutter and threader that the machine gives its best results. After the pipe has been threaded and the nipples cut to the desired length the four pipe-gripping jaws of the gripping chuck are removed and special nipple holders, made from crucible steel forgings, are substituted. They are operated by the same lever that operates the pipe-grips and close down on the thread without harming it. When the thread is cut the chuck opens with a forward movement, causing the nipple to drop into the bed of the machine. The dies open automatically when the desired length of thread has been cut, permitting the operator to give his attention to getting the next nipple ready before releasing the nipple in the machine. Graduations are placed on the side of the bed to enable quick and accurate setting of the die-releasing stop.

The machine is made by the Bignall & Keeler Manufacturing Company, Edwardsville, Ill. It is the P. D. Q. C. No. 2 Improved, with a capacity of from ¼ in. to 2 in. inclusive. There are six speeds, obtained through a three-step cone pulley and compound gears. There is an automatic oil pump in the bed of the machine. The floor space occupied by the machine is 36 in. x 70 in. and it weighs 1,800 lbs. The company makes a large line of pipe-threading and cutting-off machinery ranging from ¼ in. to 24 in. in capacity.

The first Minister of Transportation in Bavaria is Chevalier Heinrich von Frauendorfer, who has been for some years the chief of that department of the Foreign Ministry which until this year managed the State Railroads, etc. The new minister is 53 years old, the son of a school teacher, studied law at the Munich University, entered the administrative service in 1882, and the state railroad service in 1884. He has under him about 75,000 employees, about 52,000 of whom are in the railroad service, and most of the others in the postal service. The department has steamboat lines on Lake Constance, and conducts some canal and improved river navigation. The wife of the new minister is a genre painter of considerable reputation, known by her maiden name as Helene Mühlthaler.

TECHNICAL.

Manufacturing and Business.

The International Steam Pump Company of Harrison, N. J., will soon buy machinery for its new works.

The Union City Foundry of Union City, has been incorporated in Pennsylvania, with a capital of \$25,000.

The Steel Car Forge Co. has resumed work at its works in Ellwood City, Pa., after a shutdown of two months.

It is reported that the Eastern Steel Company of Pottsville, Pa., will extend its works and add new machinery at a total cost of about \$1,000,000.

The John Perkyl Iron Works, Brooklyn, N. Y., has been incorporated with a capital of \$50,000. John Perkyl, G. L. Schnepf and Robert J. Dobbin are incorporators.

The West Virginia Bridge & Construction Company has begun work at its shop at Glenova, W. Va., giving employment to 100 men. This shop has been shut down for some time.

The Hoshor-Platt Company, of New York, has been incorporated with a capital of \$80,000, to make machinery, by John C. Hoshor, Howard Ross and G. L. Young, incorporators.

H. J. Small, General Superintendent of Motive Power San Francisco, has ordered shop tools to the extent of \$300,000 for 1904, shop equipment for the Southern Pacific system.

The International Iron & Metal Company of Newark has been incorporated in New Jersey, with a capital of \$30,000, by Stephen J. McCardel, Thos. J. Reilly and Michael Blake, incorporators.

Richmond and Lynchburg, Va., capitalists have organized a company, with \$50,000 capital, to build a steel casting plant in North Birmingham, Ala. J. R. McWane, of Birmingham, is interested.

The Ajax Metal Co., Philadelphia, has bought the business, plant and good will of the Bates Metal Co., of Birmingham, Ala., and will continue it under the name of the Ajax Metal Company of the South, at Birmingham.

At a recent meeting of the directors of the Lackawanna Iron & Steel Company, the resignation of Walter Scranton as President was announced. In the new list of officers of the company, Mr. Scranton's name appears as chairman of the board.

The Central Car & Foundry Co., of Vincennes, Ind., has been formed, with a capital of \$25,000, with headquarters in Indianapolis, to deal in car and foundry material for railroad use. Joseph R. Cavanagh, H. E. Frazier and others are interested.

The American Bridge & Structural Preserving Company, of Bridgewater, Mass., has been incorporated with a capital of \$200,000. John R. Entwistle, South Framingham, Mass., is President, and Oscar L. Lefferts, Newtonville, Mass., is Treasurer and Clerk.

The Latta & Terry Construction Co. has been incorporated in New Jersey, with a capital stock of \$250,000, to do general construction work, especially bridge building. J. H. Terry, Joseph W. Wilson and J. W. Morgan, all of Camden, N. J., are the incorporators.

Announcement is made that J. M. Boyd has been appointed General Manager of the Haselton plant of the American Bridge Company, at Youngstown, Ohio, vice George Hunter. Mr. Hunter left for Ambridge to enter on his new position of Assistant General Manager at the great bridge plant there.

The White Elevated Car Company, of Indianapolis, Ind., has been incorporated with a capital of \$50,000, to make a car that will run suspended on a single overhead rail. C. N. White, of Nottingham, Ind., is the inventor. The directors are: W. P. Sockwell, A. J. Middleton, A. J. Brown and J. H. Stubbs, all of Indianapolis.

B. M. Gardner has opened an office at 541 The Rookery, Chicago, to deal in iron and steel products. He is agent of the Northern Engineering Works, Detroit; the National Elastic Nut Co., Milwaukee, and the Wallace Machine & Foundry Co., La Fayette, Ind. He will also sell light rails, cars and other mine supplies, billets, rods, sheets, bar iron and steel, steel castings, machine bolts and rivets.

The Whitaker-Glessner Iron Company, of Wheeling, W. Va., has been incorporated with a capital of \$3,000,000, by N. E. Whitaker, Alexander Glass and others, to operate the plants of the Whitaker Iron Company and Wheeling Corrugation Company of Wheeling; Laughlin Nail Company of Martin's Ferry, Ohio, and the Portsmouth Steel Company of Portsmouth, Ohio, which were recently reported contemplating a consolidation to operate under one management.

The Gordon Battery Co., New York City, reports exceedingly gratifying results of the severe tests to which its new non-freezing battery has been subjected by the extreme cold weather of the past two weeks. Railroad companies on whose lines this battery is in use for signals report that it has resisted the lowest temperatures. These reports are from railroads in the vicinity of New York City, where the temperature was lower than before for seven years, and continued very low for four days.

Adreon & Co. have incorporated in St. Louis with the following officers: E. L. Adreon, Jr., President; E. W. Hodgkins, Vice-President, and D. R. Niederlander, Secretary and Treasurer. The southwestern sales agencies have been secured for the American Brake-Shoe & Foundry Co., Railway Appliances Co., T. H. Symington Co., Railroad Supply Co., American Rolling Mill Corporation, Dressel Railway Lamp Works, Paul Dickinson, Diamond State Car Spring Co., Universal Oiler Co. Offices have been opened in suite 200, Security Building, St. Louis, Mo. The company will handle general railroad supplies and equipment and iron and steel.

Iron and Steel.

The Fort Wayne Iron & Steel Company recently started its muck mill at Fort Wayne, Ind., and the entire plant is now in operation. The main building, which is 300 ft. x 308 ft., has a capacity of 150 tons of bar iron per day.

About 8,300 tons of new rails, steel billets, old rails, scrap iron, structural steel, bar steel, old axles, car wheels and pig iron were exported in December through New York and other eastern seaboard points. The rail exports aggregated 3,256 tons, 1,999 tons going to Australia; 785 tons to Costa Rica, and 472 tons to Boca del Toro, Colombia. The steel billets to British ports amounted to 2,078 tons.

At the request of the Crucible Steel Company, which controls the Clairton Steel Company, the latter has been placed in the hands of a receiver. The company has a debt of \$4,500,000, now due, and has been unable to meet

its obligation. As the properties of the company are worth much more than this amount, Receiver Wm. G. Park may be able to arrange for the continued operation of the plants.

A new company, the American Sheet & Tin Plate Company of New Jersey, is to be formed by a merger of the American Sheet Steel Company and the American Tin Plate Company, which were originally capitalized at \$52,000,000 and \$50,000,000 respectively. Geo. W. McMurtry, Empire Building, New York City, will be chairman. The other offices of the company will be located in the Frick Building, Pittsburg, including Wm. T. Graham, President; W. M. Leeds, First Vice-President; Eugene W. Pargny, Second Vice-President, and H. B. Wheeler, Secretary and Treasurer.

In the Ohio Valley since the first of the year there have been resummptions, or partial resummptions, of many large mills, both of the United States Steel Corporation and among the independents. Among the most important resummptions was that of the Laughlin tin plant at Martin's Ferry. In the Pittsburg district the steel industry is also looking up. Upwards of 30 steel mills of various characters and blast furnaces have resumed operations within the last few weeks, and upwards of 40,000 men, some of whom had been idle for months, have returned to work. The demand for iron and steel products is increasing, and the outlook is better than it has been for four months.

Solid Steel Tool & Forging Co.

The James H. Baker Manufacturing Company, of Pittsburg, Pa., and the Solid Steel Tool Company, of Chicago, have been merged under the name of the Solid Steel Tool & Forge Company, with general office at Pittsburg. The new company has a modern and well equipped plant adapted to make railroad track tools, car forgings, drop forgings, hooks and railroad forging generally. For some time past these two interests have been closely associated in personnel. H. W. Armstrong is President and R. Miller, Jr., is Secretary and Treasurer. The Pittsburg office is in the Farmers' Bank Building. H. H. Miner is the Western Sales Manager, 11 South Jefferson street, Chicago. Other branches are in Louisville, Denver and San Francisco.

THE SCRAP HEAP.

Notes.

The Southern Pacific has renewed its contract with Armour & Co. for the operation of the cars of the fruit growers' express between California and New Orleans for two years.

General James Longstreet, United States Commissioner of Pacific Railroads, having died, the Secretary of the Interior recommends the abolition of the office. The duties of the office have been only nominal, and for years it has been held by an ex-Confederate general.

The railroads of Illinois, which have already abolished return passes for live stock drovers in cases where the State law does not apply, have asked the Railroad Commission of that State to authorize a similar change in the live stock shipping contracts for business done within the State.

The United States Court of Appeals has sustained the decision of Judge Grosscup at Chicago who denied the claim of the War Department that railroads in transporting soldiers should apply the party rate principle. It had been claimed that in asking the government a higher rate for carrying a certain number of soldiers than was asked for carrying a similar number of theatrical people or base ball players the railroad was guilty of unjust discrimination. The opinion holds that there was no violation of the law against discrimination, as the government does not come into competition with any of the parties to which party rates are granted.

The movement for the establishment of a separate railroad commission for New York City to have functions similar to those of the State Railroad Commission, but wholly local in scope, which was begun a year ago, and which is likely to be heard from in the State Legislature this year, is now being imitated in the Borough of Brooklyn, where members of the Board of Trade, with the aid of various citizens' associations, are preparing to ask for a commission for Brooklyn alone. This movement is evidently based on the assumption that the commission contemplated by the Merchants' Association and others would confine itself to Manhattan and the Bronx.

Watch Inspection on the Illinois Central.

The announcement was recently made that Mr. Webb C. Ball, of the Webb C. Ball Watch Company, Cleveland, Ohio, had been appointed General Time Inspector of the Illinois Central and of its controlled line, the Yazoo & Mississippi Valley. Mr. Ball is now the General Time Inspector of 16 different roads, including the two above named, the Cleveland & Pittsburg, the Chicago & Eastern Illinois, the New York, Ontario & Western, the Rutland and nine roads in the New York Central system, including the Central itself, and nearly, or quite all of its controlled lines west of Buffalo.

Harmony Between Hudson River Tunnel Interests.

According to press reports, the Pennsylvania, without acquiring financial interest, has made a traffic arrangement by which the Hudson & Manhattan, upon the completion of its tunnel under the North river, will handle traffic originating on the Pennsylvania destined for the downtown district of New York. In return, it is said the Pennsylvania gives facilities for all necessary terminals

in Jersey City. By this arrangement the suburban traffic, instead of being carried to Twenty-third street, through the Pennsylvania tunnel, will be transferred to the Hudson and Manhattan at Jersey City.

Tired Nature's Sweet Restorer—

Is still available to New York State legislators on the cars without violating either their consciences (?) or their pocket books. According to the New York *Evening Post*, "the Pullman Company has found a way of getting around the constitution of New York which forbids the members of the State Legislature from accepting and using its passes. It is simply the filling out of the pass in the name of Mrs. Senator So-and-So and Mrs. Assemblyman Jones-Smith, instead of in the name of the Senators and Assemblymen themselves. That a great number of legislators are bachelors seems not to have troubled the company in the least. The passes are all filled out in the same manner, and entitle Mrs. Jones-Smith 'and one other' to a seat or berth in the cars of the company on any of the lines in the State. The passes were sent to the members of the Senate and Assembly in letters addressed 'Dear Madam.'"

Lien on Freight for Customs Duties.

In an opinion by Justice Brewer, the Supreme Court of the United States has decided the case of the Wabash Railroad against William N. Pearse, executor, involving the question as to whether a common carrier retains a lien on imported goods shipped in bond to a given point and on which import duties have been paid by the company in transit. The goods involved came from Japan by the Canadian Pacific and connecting lines to St. Paul, where the railroad was required to and did pay the duty amounting to \$264. The goods were transferred to the Wabash and by it delivered at St. Louis. Pearse resisted the claim of the railroad to hold the goods until the money paid on account of the tariff should be refunded, and the Court of Appeals sustained this view. That decision is now reversed. It is held that "it is the common law duty of the carrier to receive, carry and deliver goods, and by virtue of this obligation it is entitled to retain possession until its charges are paid. Nor is this lien confined to its charges for transportation."

Railroad Building in China.

The two most important roads in South China, on which work is now in progress, are a short line from Canton west to Samshui, 31 miles, and a long line from Canton north to Wuchang, on the Yang-tse-Kiang, nearly opposite Hankow, 750 miles. Both these railroads are being built by the American-China Development Company, of which Wm. B. Parsons is President; W. E. Gray, Shanghai, General Manager, and C. W. Mead, Chief Engineer. Surveys for the former were begun in August, 1902, and the line is now completed from Canton to Fatsan, 11 miles, while track-laying is in progress on the remaining portion from Fatsan to Samshui. The road is standard gage throughout, ballasted with broken stone, with Belgian steel sleepers 8 ft. long, and laid with 75-lb. rails. The rolling stock has been ordered from America, and includes 20 freight cars of 80,000 lbs. capacity, and five 130-ton locomotives. Signaling arrangements have not yet been completed. The line from Canton to Wuchang, which follows the course of the North River in Kwangtung Province and crosses the watershed into the Yang-tse Valley by a pass known as Parsons Gap, 1,200 ft. above the sea level, has been surveyed for a distance of 110 miles out of Canton. This road is also to be standard gage and the work will require only a few tunnels and bridges. The heaviest cutting will be encountered just north of Canton, where there is a large amount of rock. The surveying parties have had some trouble with the natives, as the latter have not become fully reconciled to the "foreign devil," but this has not proved a very serious nature. Trouble arising from disturbance of graves, which at first proved to be quite an obstacle, has now been amicably settled. A large number of ancestral graves are scattered throughout the country and the company has now agreed to pay a fixed price of about \$2.50 per grave to the native owners. The labor question, which was very perplexing, owing to the number of Chinese guilds, has been successfully solved, and coolie labor is used exclusively, at the rate of 22 cents per man per day, which is nearly double the amount paid the ordinary coolie.—*Engineering Magazine*.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

Central Railway Club.

At the annual meeting of this club, held in Buffalo, Jan. 8, a paper on "Gas and Gasoline Engines in Railroad Work" was read and illustrated by lantern slides. The Secretary's report showed that the club was strong in membership and that the last surplus was the largest in the history of the club. Officers were elected for the ensuing year as follows: President, James Macbeth, N. Y. C. & H. R., Buffalo; Vice-President, C. E. Turner, B. R. & P., Rochester; Secretary-Treasurer, Harry D. Vought, New York City; Assistant Secretary, B. M. Tate, Buffalo. In the evening the club held its annual dance and entertainment.

Engineers' Society of Western Pennsylvania.

At the annual meeting of the Engineers' Society of Western Pennsylvania held in Pittsburg, Jan. 8, officers

were elected as follows: President, James M. Camp; First Vice-President, Samuel Diescher; Second Vice-President, G. E. Flanagan; Directors, J. K. Lyons and Willis Whited; Treasurer, A. E. Frost; Secretary, Charles W. Ridinger. The address of the retiring President, Chester B. Albree, who was absent on account of illness, was read by the Secretary. It dwelt largely upon the technical schools of Germany, and compared the work done there with that which is being outlined by the Carnegie technical schools of Pittsburg. The membership of the organization has increased in the past year from 588 to 870.

PERSONAL.

—Mr. John R. MacMurdo, a prominent railroad man of the south and for several years connected with the Richmond & Allegheny, died at his home in Ashland, Va., January 11, at the age of 68.

—Mr. Henry F. Baldwin, Chief Engineer of the Chicago & Alton, has resigned that office to become Vice-



President and General Manager of a DuPont Powder Company, with headquarters at Philadelphia. He was born in 1862, graduated from Massachusetts Institute of Technology with a degree in mechanical engineering, and began railroad work in 1884 with the Louisville & Nashville as a rodman. He rose to Supervisor on this road, and in 1889 went to the New York, Lake Erie & Western as Division Roadmaster. A year later he became Chief Engineer of the Chicago & Eastern Illinois, remaining four years, and then went to the Chicago, Peoria & St. Louis in the same capacity. He left the latter in 1895 to go to the Erie as Engineer of Maintenance of Way, and remained until 1900, when he took the position with the Alton which he now resigns. His record with the Alton has added much to his distinction as an engineer. During his four years of service the road has been in large part rebuilt and greatly improved, grades being reduced, heavier rails laid and the line re-ballasted. Many miles of side and yard tracks have been built and a large amount of new bridge work done, most of the bridges being of steel on concrete masonry. Electric block signals covering 335 miles of main track have been put in and interlocking plants at 26 crossings erected. The rebuilding of the Bloomington shops and the installation of 13 coaling stations which elevate and store the coal and weigh the amounts given to locomotives have been described in these columns. Perhaps the two most important projects of which Mr. Baldwin has had charge were the rebuilding of Glasgow bridge over the Missouri River and track elevation work in Chicago. Glasgow bridge contains 3,500 tons of steel and cost \$1,000,000. The track elevation work when completed will be 3½ miles long and will cost \$1,224,000. The total expenditure for improvements during Mr. Baldwin's connection with the road aggregated about \$12,000,000, and the work included new passenger stations and freight houses, improvement of water supply, etc.

—General George L. Becker, at one time Chairman of the Minnesota Railroad and Warehouse Commission, died recently. In the early fifties Gen. Becker was the Democratic candidate for Governor.

—Mr. George C. Holmes, who recently resigned as Purchasing Agent of the Chicago, Peoria & St. Louis, has become associated with the Sales Department of the Commonwealth Railway Supply Company, Monadnock Block, Chicago.

—Mr. Asa L. Foster, formerly General Freight Agent of the Lehigh Valley, died at his home in Bethlehem, Pa., on Monday of this week at the age of 45. Mr. Foster was born at Mauch Chunk, Pa. His first railroad service was in 1881, when he began in a subordinate position on the Lehigh Valley. He was appointed General Freight Agent in 1898.

—The death of Mr. Theodore D. Kline comes as a great surprise to his many friends. Less than a month ago we announced in these columns Mr. Kline's promotion to the General Managership of the Central of Georgia Railway. At that time we printed a portrait and sketch of his life, which will be found in our issue of December 25, page 928. Mr. Kline died at his home in Savannah, Ga., on Sunday, January 10.

—Mr. Thomas N. Jarvis, the new Freight Traffic Manager of the Lehigh Valley, has been in railroad service since 1874. In that year he worked for the Grand Trunk at Black Rock. Later he was made chief clerk of the Commercial Express and in 1883 was appointed Manager of the Traders Despatch Fast Freight Line. In 1898 Mr. Jarvis came east as General Eastern Freight Agent of the Lehigh Valley, and in March, last year, he was appointed General Freight Agent, from which position he is now promoted to that of Freight Traffic Manager. His office will be at New York City.

—Mr. John Allen Muir, for a number of years Superintendent of the Los Angeles Division of the Southern Pacific and General Manager of the Los Angeles Railway, died at his home in Los Angeles on Friday of last week. Mr. Muir was 54 years old, and was a native of Truro, N. S. He began his railroad service in 1870 as a telegraph operator at Rocklin, Cal., for the Central Pacific. Since that time he passed through various subordinate positions, finally becoming Division Superintendent of the Los Angeles Division of the Southern Pacific, from which position he resigned to take the General Managership of the Los Angeles Railway.

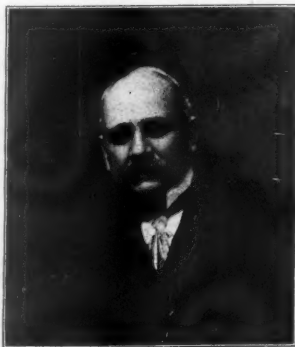
—General Charles A. Chipley, at one time General Freight Agent of the Pennsylvania Railroad, died suddenly at his home in Easton, Md., on January 7. Gen. Chipley was born in Alexandria, Va., 68 years ago. At the age of 17 he learned the machinist's trade, and in 1854 entered the navy, where he served three years. In 1870 he entered the service of the Baltimore & Ohio as clerk in the office of the General Freight Agent. Two years later he was made Agent for the company at Pittsburg, and in 1873 he was made Assistant General Freight Agent. In 1878 he went to the Pittsburg & Lake Erie as General Freight Agent, but resigned two years later to take the General Agency of the Union Lines of the Pennsylvania. Later he was promoted to be Assistant General Freight Agent of the Pennsylvania and finally became General Freight Agent.

—Mr. J. A. Warner, who succeeds Mr. Fennell as Superintendent of the Highland Division of the New York, New Haven & Hartford, is a native of Connecticut. He was born in Windsor Locks in 1859, and entered railroad service in 1880, as a station helper at Rockville, Conn., for the New York & New England, later becoming Agent at that point. In December, 1887, he was transferred to Waterbury, Conn., as Freight Agent, and in May, two years later, he was appointed Assistant Freight Agent at Boston. Shortly after, however, Mr. Warner was made Freight Cashier there and remained in the latter position until February, 1897, when upon the consolidation of the New England Railroad with the New York, New Haven & Hartford, he was appointed Agent of Freight Terminals at Boston, which position he now resigns to become Superintendent at Hartford.

—Mr. Andrew Donaldson, for several years Third Vice-President of the New York, Lake Erie & Western and its successor, the Erie, died on Sunday, January 10, at his home in East Orange, N. J. Mr. Donaldson was 59 years old, having been born at Cincinnati, Ohio, in 1845. At the age of 18 he entered the navy and served throughout the Civil War. His railroad service dates from 1870, when he began as a clerk on the Ohio & Mississippi. He had been connected with the Erie for a great many years, first being Auditor and then Third Vice-President. Mr. Donaldson retired from railroad service a few years ago, and since then had been Treasurer of the Consolidated Cross Tie Company of New York, and the Directors of this company passed resolutions testifying to the high sense of duty and integrity of character of Mr. Donaldson. He did his work with fidelity, capability and zeal. With his associates his relations were most kindly and amiable.

—Mr. Othniel F. Nichols, who has been made Chief Engineer of the Bridge Department of the City of New York, was born in Newport, R. I., and received his education at the Brooklyn, N. Y., public schools and at Rensselaer Polytechnic Institute, where he graduated as a civil engineer in the Class of 1868. Before entering the technical school he had learned the trade of machinist, and after graduating at the Polytechnic Institute he was appointed assistant engineer on Prospect Park, Brooklyn.

He left the park to become assistant engineer of the Greenwich Street elevated railroad, New York City, and built the first elevated railroad foundations north of Cortlandt street. In 1870 and 1871 he was assistant to Edward Cooper, President of the New Jersey Steel & Iron Co., and in the last named year became assistant engineer of the Lima & Oroya Railroad in Peru. He remained on the Oroya two years in charge of tunnel location and construction, and then became division engineer of the Chimboite railroad, where he had charge of work of the same kind. Returning to the United States in 1876 he was assistant superintendent and engineer of the Edgemore Bridge Co., in the execution of its contract for the construction of the Sixth Avenue Elevated railroad, New York City. This work was delayed by injunctions, and Mr. Nichols entered the service of the Park Department in charge of sewer work in the annexed district. In 1878 he was resident engineer of the Madeira & Mamore Railway in Brazil, and spent the first half of 1879 in London in connection with litigation which grew out of this enterprise. In 1879 and 1880 he was assistant engineer in the bridge shops of the New Jersey Steel & Iron Company at Trenton. In 1881 he was for a time assistant superintendent of the Peter Cooper glue factory, and



from that time until 1885 he was Resident Engineer of the Louisville & Nashville bridge over the Ohio River at Henderson, Ky. In 1886 he was chief engineer of the water works of Westerly, R. I., and resigned this position to become Principal Assistant Engineer for the Suburban Rapid Transit Company in New York City. On the consolidation of this company with the Manhattan Railway he became Chief Engineer of the Brooklyn Elevated, and he designed and built about half of the elevated roads in Brooklyn belonging to that company. In 1892 and 1893 he was General Manager as well as Chief Engineer of the company, and while connected with this work he made the first surveys for the Williamsburgh bridge, which was then expected to be built by a private company allied with the Brooklyn Elevated. As soon as Mr. L. L. Buck was made Chief Engineer of this bridge, in 1895, he named Mr. Nichols for his Principal Assistant, and he held this position until July, 1903. Mr. Nichols is a member of the Engineers' Club of New York City, President of the Brooklyn Engineers' Club, a member of the Institution of Civil Engineers, of the American Society of Civil Engineers, of the American Society of Mechanical Engineers, of the Rensselaer Society of Civil Engineers, and a fellow of the Geographical Society. He is an engineer of great accomplishments and his successful experience as a railroad officer demonstrated his fitness for the administrative duties which form a considerable part of his work in his new position.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—G. E. Roe, hitherto Division Freight and Passenger Agent at El Paso, Texas, has been appointed General Freight and Passenger Agent, with office at Kansas City.

Baltimore & Ohio.—It is announced that D. D. Carothers, hitherto General Superintendent of the Baltimore & Ohio Southwestern, will on February 1 become Chief Engineer of the B. & O., succeeding J. M. Graham.

Baltimore & Ohio Southwestern.—See Baltimore & Ohio.

Birmingham & Atlantic.—John C. Soley, General Manager, has been appointed Chief Engineer also.

Brunswick & Birmingham.—The title of J. R. Mangham has been changed from Car Service Agent to Superintendent of Car Service. L. W. Robert, Chief Engineer, has been appointed Superintendent of Maintenance of Way also.

Buffalo, Bradford & Kane (Bradford, Bordell & Kinzua).—The officers of this company are: President, W. E. Olmstead; Vice-President, Robert H. England; Treasurer, F. A. Lehr; General Freight and Passenger Agent, H. H. Gardiner, and Auditor, W. H. Baumes.

Chicago, Peoria & St. Louis.—George C. Holmes, Purchasing Agent, has resigned.

Chicago Union Transfer.—R. B. Mason has been elected Vice-President, succeeding E. P. Broughton, deceased.

Cleveland, Cincinnati, Chicago & St. Louis.—W. K. High has been appointed Master Mechanic, with headquarters at Wabash, Ind., succeeding W. J. Thomas, and Mr. High is succeeded as Master Mechanic at Mt. Carmel, Ill., by D. J. Mullen.

Colfax Northern.—Mrs. T. N. Hooper has been chosen President to succeed her husband, the late T. N. Hooper.

Delaware & Hudson.—T. W. Crowley has been appointed Assistant to the General Superintendent, with office at Albany, N. Y.

East Tennessee & Western North Carolina.—The headquarters of President R. F. Hoke, have been removed from Raleigh to Cranberry, N. C.

Florida & Georgia.—The headquarters of Fred Larkins, Treasurer and Traffic Manager, have been removed from Jacksonville, Fla., to Birmingham, Ala.

Kansas City, Mexico & Orient.—T. N. McCauley has been elected a Director, succeeding J. J. Sylvester, deceased.

Knoxville & Augusta.—See Knoxville & Bristol.

Knoxville & Bristol.—W. P. Hood, hitherto Superintendent of the Knoxville & Augusta, has been appointed Superintendent of the K. & B.

Lake Terminal.—J. G. Masterson, General Manager, with headquarters at Lorain, Ohio, has resigned.

Lehigh & New England.—Daniel Hardy has been appointed General Superintendent, with headquarters at Pen Argyl, Pa.

Macon & Birmingham.—E. A. Martel has been appointed Comptroller. The position of Auditor and Cashier has been abolished.

Morgan's Louisiana & Texas.—C. S. Fay, hitherto Assistant General Freight Agent at New Orleans, La., has been appointed General Freight Agent. T. O. Edwards has been appointed Auditor, with office at New Orleans, succeeding Charles E. Wernuth, resigned.

New Haven & Northampton.—C. S. Mellen has been elected President.

Newton & Northwestern.—W. H. Benn has been appointed General Freight and Passenger Agent, with headquarters at Boone, Iowa.

New York, New Haven & Hartford.—W. P. Appleyard, Master Car Builder at New Haven, Conn., has resigned, effective Feb. 1.
See Pullman Company.

Pittsburg, Shawmut & Northern.—C. A. Derr, Engineer of Maintenance of Way, with headquarters at St. Marys, Pa., has resigned, and that office has been abolished.

Pullman Company.—William P. Appleyard, hitherto Master Car Builder of the New York, New Haven & Hartford, has been appointed Superintendent of Repairs of the Pullman Company.

Queen Anne's.—J. C. Hiltabidle has been appointed Acting Auditor, with office at Love Point, Md., succeeding J. Hennaman, Auditor, resigned.

Rock Island Company of New Jersey.—L. F. Loree has been elected a Director, succeeding A. R. Flower.

San Francisco & Northwestern.—R. J. Quintrell has

been appointed Master Mechanic, with headquarters at South Bay, Cal., succeeding H. Whitham, resigned. C. L. Rose, Superintendent of Tracks, Bridges and Buildings, has resigned, and that office has been abolished.

Southern.—P. I. Welles, Superintendent at Columbia, S. C., has resigned.

Southern Pacific.—R. S. Lovett has been elected Counsel for this company and the Union Pacific, with office in New York City.

R. L. Ellzey has been appointed Assistant Superintendent of Telegraph, with office at San Francisco, Cal.

Spokane Falls & Northern.—C. H. Prescott, recently resigned as Master Mechanic of the Spokane Division of the Great Northern, has been appointed Master Mechanic of the S. F. & N., with headquarters at Spokane, Wash.

Tennessee Central.—O. M. Sewell, hitherto Acting Superintendent, has been appointed Superintendent.

Union Pacific.—At a meeting held last week E. H. Harriman was chosen President to succeed H. G. Burt, resigned.

Wabash.—A. G. Trippier, hitherto Resident Engineer, has been appointed Assistant to the Chief Engineer, with headquarters at Decatur, Ill.

LOCOMOTIVE BUILDING.

The New Orleans & Northeastern is having two locomotives built at the Baldwin Works.

The Delaware, Lackawanna & Western has ordered 30 locomotives from the Baldwin Works.

The New York, Philadelphia & Norfolk is having three locomotives built at the Baldwin Works.

The Norfolk & Portsmouth Belt Line is having one locomotive built at the Baldwin Works.

The Denver & Southwestern is reported to have placed an order for two locomotives with the American Locomotive Company.

The New York Central & Hudson River are about to let an order for a large number of locomotives. The number is stated to be 120.

The New York, Chicago & St. Louis is having five locomotives built at the Schenectady Works of the American Locomotive Company.

The American Locomotive Company has received a contract to build three locomotives for use on the Hokkaido railroads in Japan. These locomotives will be built at the Schenectady Works.

CAR BUILDING.

The Union Tank Line is reported to be figuring on 300 tank cars.

Armour & Co. will build 200 fruit cars at its shops at Kansas City.

The Pullman Company is building 25 coaches for its own general service.

The Exposition Water Co., St. Louis, is expecting to build about 50 tank cars.

The American Car & Foundry Company has miscellaneous orders for 10 cars.

The Cincinnati, Hamilton & Dayton is reported in the market for new equipment.

The Pere Marquette has ordered 28 passenger coaches from the Pullman Company.

The Menasha Wooden Ware Company is having 81 freights built by the Haskell & Barker Car Co.

The Wabash is reported to be going to build a large number of passenger cars for St. Louis Exposition use.

The Minneapolis, St. Paul & Sault Ste. Marie is reported in the market for 300 freight cars and four passenger cars.

The Rodger Ballast Car Company is having 20 freights built at the West Detroit Works of the American Car & Foundry Company.

The Denver, North Western & Pacific has ordered 100 gondola cars of 80,000 lbs. capacity from the Pullman Co., for February delivery. The cars will be 36 ft. 10 in. long, over end sills; 9 ft. 10 in. wide, over side sills, and 8 ft. 5 in. high from top of rail to top of side, to be built of wood, with wooden underframes. The special equipment includes: American Steel Foundries' bolsters, Westinghouse air-brakes, More-Jones' brasses, Climax solid-knuckle couplers, Republic friction draft rigging, McCord dust guards, journal boxes and lids, Sherwin-Williams paint, Railway Steel Spring Co.'s springs and metal trucks.

BRIDGE BUILDING.

ALBANY, N. Y.—Bids are wanted Jan. 18 by E. A. Bond, State Engineer, for building a bridge over Great Sodus Bay at Resort.

ALLEGHENY, PA.—The Forest Bridge Company has applied for a charter to build a steel railroad and highway bridge for the Pittsburgh Railways Company over the ravine at Jacks Run, connecting Allegheny and Bellevue.

ASHTABULA, OHIO.—Plans are being made for a new swing or lift bridge to be built at Ashtabula harbor by the county and the railroads interested.

BATAVIA, N. Y.—The Batavia and Pembroke town boards may build a bridge over Tonawanda Creek. Supervisor Thomas, of Batavia, is a member of the committee.

BURNSIDE, KY.—The Pulaski County Fiscal Court has taken steps for the building of a steel bridge to cost \$26,000 over the south fork of Cumberland River, connecting Burnside and Bronston.

CHATTANOOGA, TENN.—The Chattanooga Electric Railway Co. has under consideration the question of building a steel viaduct 50 ft. long and 30 ft. wide, over the Cincinnati Southern tracks at Oak street.

CINCINNATI, OHIO.—The question of building a bridge at Harrison avenue to cost \$250,000, is under consideration.

CUMBERLAND, MD.—Contracts have been awarded by Allegheny County Commissioners to the Riverside Bridge

Construction Company of Wheeling, W. Va., for building a steel bridge over the Potomac River between Cumberland and Sinclairville; also for a new bridge over the Potomac River between Westernport and Piedmont.

DANVERS, MASS.—Essex County Commissioners, the Town of Danvers, the Boston & Maine and the Boston & Northern (street railroad) have agreed upon a commission to estimate the cost of rebuilding jointly the Maple street bridge over the Boston & Maine tracks.

DAYTON, OHIO.—Bids are wanted Jan. 30, for \$25,000 of bridge bonds. D. Phillips is City Auditor.

DENVER, COLO.—Bids are wanted Jan. 25 by L. G. Carpenter, State Engineer, for building a bridge 343 ft. long, or 265 ft. long, according to the site to be selected, over the Grand River between Rifle and Parachute, Garfield County, Colo.

ELIZABETH, N. J.—A bill has been introduced in the Lower House of Congress by Representative Benny to preserve the rights granted by a previous bill for building a bridge over Newark Bay from Elizabeth to Bayonne.

EVERETT, WASH.—Plans, it is reported, are ready for the building of a bridge over Snohomish River. W. D. Barkhuff is City Engineer.

FREDERICTON, N. B.—The Commissioner of Public Works is asking for bids for rebuilding Black River bridge, St. John County; the Elliott bridge in Queen's County, and the Aboushegan bridge in Westmorland County. The provincial government is receiving bids up to January 18, for building a steel structure at the Rye Road bridge at the mouth of Black River.

JEFFERSON, OHIO.—Bids are wanted Jan. 30, by the County Commissioners, for building the superstructure of a highway bridge over Conneaut Creek, 144 ft. long and 18 ft. wide.

JERSEY CITY, N. J.—The joint bridge committee of the boards of freeholders of Essex and Hudson Counties has decided to recommend that the contract for the new plank road bridge over the Hackensack River be awarded to Sanford & Harris, Newark, N. J., whose bid was \$515,000. (Dec. 4, 1903, p. 877.)

LOGANSPOUT, IND.—The Logansport, Rochester & Northern Traction Company has under consideration the question of building a bridge at Fifth street.

MEMPHIS, OHIO.—The Union Railway Company, it is reported, has awarded the contract to Weatherford & Carey Bros. of Memphis for \$12,000, for concrete abutment for the overhead bridges at Cooper, McLeMore, Central and Trezevant avenues.

NEWARK, N. J.—The Park Commissioners have approved the general plans for building three bridges in Branch Brook Park, at an aggregate cost of \$235,000. One of the bridges will carry Fifth avenue over the park and connect the Southern and Middle divisions over the waterway; another will carry Bloomfield avenue over the waterway, and the remaining bridge will carry Fifth avenue over the railroad tracks at Thirteenth street.

NORTH VANCOUVER, B. C.—The by-law to provide funds for construction of bridges was carried by the ratepayers.

OTTAWA, ONT.—The by-law to provide for the construction of the Bell street bridge has passed second reading in the City Council.

PESHTIGO, MICH.—The Wisconsin & Michigan is preparing plans for replacing the bridge over the Peshtigo River with a new steel structure; also for a number of other bridges along the line of its road.

PITTSBURG, PA.—The Council appropriation ordinance for 1904 contains an item of \$150,000 for repairs to Point bridge, and \$82,875 for other bridge repair work.

SANTA ROSA, CAL.—The California Northwestern, it is reported, is preparing plans for replacing the drawbridge over Petaluma Creek with a steel structure.

SIoux CITY, IOWA.—Bids are wanted Jan. 26, by the City Clerk, for building a steel Pratt truss bridge 162 ft. long over the Floyd River, to cost about \$10,000. J. M. Lewis is City Engineer.

It is reported that Swift & Co., owners of half the street car system, have acquired the control of the \$2,000,000 combination road and wagon bridge over the Missouri River.

TOLEDO, OHIO.—The sub-committee on the location of a bridge 2,700 ft. long and 80 ft. wide over the Maumee River has recommended Jefferson street as the site. The probable cost will be \$500,000.

WASHINGTON, D. C.—Bids are wanted Feb. 16, by the District Commissioners, for building a seven-span masonry bridge over Rock Creek Valley, on the line of Connecticut avenue. H. B. F. MacFarland is Commissioner.

WASHINGTON'S CROSSING, N. J.—At a recent meeting of the stockholders of the Delaware Bridge Company, a committee was appointed to ask bids and award the contract for building the new bridge over the Delaware River at this place.

WESTCHESTER, PA.—East Fallowfield township has appointed a committee to meet Jan. 16, to select a site for a county bridge to be built on West State street, over the west branch of White Clay Creek, in the Borough of Avondale.

YORK, NEB.—Bids are being asked until Feb. 16, for building all the bridges in York County during the year 1904. C. C. Boslaw is County Clerk.

Other Structures.

AGUAS CALIENTES, MEXICO.—The city has given \$18,000 to the Mexican Central Ry., for the car shops, on which work is now in progress.

DAYTON, OHIO.—It is reported that the Union Traction Company has its plans for building a large union passenger station approved by the Council committee.

DECATUR, ALA.—At a recent meeting of the State Railroad Commission, it was decided to ask the railroads to build a union station in Decatur.

DILLON, S. C.—The Atlantic Coast Line, it is reported, will build a new brick passenger station and freight house.

GLENWOOD, PA.—The Baltimore & Ohio, it is reported, has taken out building permits for a brick roundhouse to cost \$75,000, a trainmen's house to cost \$5,000, and a pit and coal stacking plant to cost \$3,100.

HAMMOND, IND.—The Chicago Steel Manufacturing Company's works, Hammond, Ind., recently destroyed by fire at a loss of \$75,000, it is reported, will be rebuilt on a larger scale.

HORNOS, STATE OF COAHUILA, MEXICO.—It is reported

that Claudio J. Martinez and others have completed arrangements for building a foundry and shops at Hornos, near Viesca, to cost about \$300,000.

KNOXVILLE, TENN.—Anderson & Co., of St. Louis, are preparing to commence work on the new passenger station. Much of the work on the new station of the Knoxville, La Follette & Jellico will be sublet.

LITCHFIELD, ILL.—The American Radiator Co. of Chicago has agreed to build large steel and brick shops at this place to cost about \$150,000.

MONTREAL, QUE.—The Railway Supply Works of F. E. Came, recently destroyed by fire, are being rebuilt. The new building is to be 80 ft. x 400 ft. A small amount of machinery may be required.

The Department of Public Works has approved plans for building two-story steel sheds on the industrial wharves, for which bids will be asked at once. J. Kennedy is Chief Engineer of the Montreal Harbor Commissioners.

OLEAN, N. Y.—The Pittsburg, Shawmut & Northern, it is reported, is looking for a site for its new shops to be built at this place.

ORANGE, N. J.—The Delaware, Lackawanna & Western, it is reported, will build two new passenger stations—one at Highland avenue, to cost \$49,000, and the other at Lincoln avenue, to cost \$53,000.

PARSONS, KAN.—The Missouri, Kansas & Texas, it is reported, has plans ready for the enlargement of its shops at Parsons.

PITTSBURG, PA.—It is reported that the Wabash, on its extension into this city, will build about 15 stations, the largest of which will be located at Carnegie and Bridgeville.

ROSSLYNN, VA.—The Old Dominion & Great Falls has bought several acres of land near the aqueduct bridge, and is preparing plans for its new power house.

St. JOHN, N. B.—Bids are wanted Feb. 3 by S. A. Corbitt, Secretary of the Imperial Dry Dock Company, for building a dry dock, etc., at St. John.

SOUTH NASHVILLE, TENN.—The Tennessee Central shops, recently destroyed by fire, will be rebuilt at once, on the same site, on a larger scale.

SYRACUSE, N. Y.—The Syracuse Rapid Transit Company will build its three-story brick and stone station at Courtland avenue, at a cost of about \$30,000, early this spring, for which bids will soon be asked by E. G. Connette, General Manager.

WASHINGTON, D. C.—Bids are wanted Feb. 6, by the Bureau of Yards and Docks, Navy Department, for building steel and concrete extensions to piers 2 and 3 in the Navy Yard at League Island, Pa., for which funds are available to the extent of \$115,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA CENTRAL.—This company has graded nine miles of its line from Booth's Station, on the Mobile & Ohio, to Autaugaville, La. The earthwork is already done and bridges are practically completed. W. H. Garret is in charge of the work.

APALACHICOLA NORTHERN.—Contracts for grading this road from River Junction, Fla., north to Apalachicola, 73 miles, will be let within 60 days. T. W. Nicoll, Mobile, Ala., is Engineer in charge of the construction. (Oct. 23, 1903, p. 708.)

ARKANSAS CENTRAL.—It is reported that this company will build an extension from Paris, Ark., to Russellville, and eventually to Bald Knob, 133 miles. The road at present runs from Fort Smith, Ark., to Paris, 46 miles.

ARKANSAS SOUTHEASTERN.—This road has been extended from Cherry Ridge Junction, La., east to Tugwell City, a distance of 12 miles.

ARKANSAS SOUTHERN.—This road is reported in progress on an extension of this work from Winnfield to Alexandria, La., 50 miles. The maximum curvature is 3½ deg., and the maximum grade .9 of one per cent. G. W. Hunter, St. Louis, is President, and J. A. Knox, Ruston, La., Chief Engineer. (Nov. 27, 1903, p. 858.)

BUFFALO FRONTIER TERMINAL.—Incorporation has been granted this company at Buffalo. It is proposed to build a steam railroad 30 miles long in Erie County, from Hamburg, on Lake Erie, north through Buffalo to the Niagara River at Tonawanda. This road, if built, will connect the Lake Shore & Michigan Southern and the New York, Chicago & St. Louis with the New York Central, and Erie at Tonawanda. W. B. Cutler, C. W. Goodyear, F. H. Goodyear, A. D. Bissell, C. B. Huntley and G. S. Field, of Buffalo, N. Y., are incorporators.

INTERNATIONAL & GREAT NORTHERN.—It is stated that this company will soon ask for bids for building a tunnel under the city of Galveston, Texas. J. D. Trammel, Palestine, Texas, is Chief Engineer.

CANADIAN PACIFIC.—The new line from Labelle to Nominigou, 25 miles, has been completed by the contractors, D. R. McDonald & Co., and has been turned over to the railroad company.

CAROLINA & NORTHWESTERN.—Press reports state that this company is planning to build an extension from Lenoir, N. C., to Carey's Flats, 35 miles. J. R. Ervin, Lenoir, N. C., is Chief Engineer. (May 15, 1903, p. 351.)

CHICAGO, ROCK ISLAND & PACIFIC.—It has been decided to build a second track from Kansas City to Topeka. Plans for an air line cut-off from Eldon, Iowa, to Kansas City, have been drawn, and it is stated that work will soon be begun. It is also announced that the company will build its own tracks from Limon, Colo., to Denver.

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA.—Contract is reported let to Winston Bros., of Minneapolis, for grading an extension from Radisson, Wis., northwest a distance of 10 miles. It is also reported that an extension will soon be built from Chippewa Valley Junction, Wis., to Cumberland.

DELAWARE, LACKAWANNA & WESTERN.—This company has asked permission to elevate its tracks and build a bridge over the Ohio Basin slip, in Buffalo, N. Y.

DENVER, NORTHWESTERN & PACIFIC.—An officer is reported as saying that this company has completed 25 miles of line, and that an additional 50 miles is now graded on which track laying will be begun within the next few weeks. (Aug. 7, 1903, p. 580.)

DIAMOND & CALDER.—The California Sash & Door Company is building a railroad from Diamond, Cal., two miles southwest of Placerville, to Calder, 33½ miles.

Grading is already in progress. This company is the same as the one mentioned in our issue of Jan. 1, p. 18, under the heading of California Roads.

DULUTH, MISSISSAUGA & NORTHERN.—It is reported that a contract will shortly be let for building a second track to the St. Clair, Monroe, Shenango, Clark and Chisholm mills near Duluth, Minn. J. H. Gordon, Powers, Minn., is Chief Engineer.

DULUTH, VIRGINIA & RAINY LAKE.—An officer writes that this company has completed its extension from Virginia, Minn., north to Ashawa, 25 miles. (July 24, 1903, p. 548.)

GEORGIA, FLORIDA & ALABAMA.—Surveys will shortly be begun on an extension of this road north toward Cuthbert, Ga., and it is stated that grading will be begun early in the spring. The road at present runs from Tallahassee, Fla., to Arlington, Ga., 81 miles, and from Arlington to Cuthbert, 26 miles. J. P. Williams, Savannah, is President.

GRAND TRUNK.—It is stated that an agreement has been made by this company with the Union Stock Yards Company of Toronto, whereby the latter will build a five-mile connection between the Northern Division and the Stratford Division of the Grand Trunk.

GREEN BAY, OSHKOSH, MADISON & SOUTHWESTERN.—Surveys are reported completed from Madison, Wis., to Ripon, and it is stated that grading will soon be begun. The road is projected from Madison to Green Bay, 150 miles. R. H. Hackett, Oshkosh, is interested. (Jan. 1, p. 18.)

IONIA & OWOSSO (ELECTRIC).—Articles of incorporation have been filed by this company in Michigan. It is proposed to build an electric railroad through Lyons, Pewamo, Fowler, St. Johns, Burton and Owosso, a distance of 45 miles. E. M. Hopkins, Lansing, is President, and J. T. Rich, Vice-President.

LOUISIANA ROADS.—It is reported that the White Castle Lumber & Shingle Company has completed arrangements for building an extension from White Castle, La., to Lake Natchez, 20 miles. This extension will give the company an outlet at Morgan City, from which point logs may be carried to the plant of the company at White Castle.

MEXICAN ROADS.—A concession has been granted in the State of San Luis Potosi to General Julio M. Cervantes to build a railroad from San Mateo on the line of the Mexican Central to Jiltila, with a branch to Tamazunchale. Five kilometers have to be built during the coming year, and 15 during each subsequent year until the line is completed. The concessionaire is granted the privilege of importing free of duty all material needed for the construction of the road.

A company is being organized in Tepic to build a railroad from that city to San Marcos, the terminus of the Mexican Central's Las Vegas branch.

Work on the railroad that is being built from the Tula iron works in the State of Jalisco to a point on the Mexican Central, 44 miles, is progressing favorably.

A concession has been granted by the Mexican Government for a railroad which will unite Talpachua, in the State of Michoacan, with Angangueo. Preliminary surveys have already commenced, and ten kilometers of the road must be finished within 18 months, and at least ten kilometers more each succeeding year.

It is rumored that work will soon begin on a railroad from Ciudad Juarez to the Pacific Coast. This line, although it will parallel for some distance that of the Sierra Madre, does not form part of that system. The head of the syndicate which proposes to build this line is David Jones.

It is definitely known that some Colorado capitalists, headed by David Moffat, will ask the Mexican Government for a concession authorizing the building of a railroad from the frontier of Sonora to Guadalupe, making connection in that city with the Mexican Central. The line in question will start at Douglas, and will pass through the rich mining district of Cananea and through the Yaqui Valley to the Gulf of California, from where it will run south to the port of Topolabampo, where it will connect with the Kansas City, Mexico & Orient, and from there to Guadalupe. This line will be known as the Mexican Railroad of the Coast, and its length will be nearly 1,500 miles.

The project which was taken up some time ago for building a railroad from Tezonapa to Rio Pinto, on the Vera Cruz and Pacific, a distance of 42 kilometers, has again been revived by several Cordova capitalists, who will endeavor to carry it out.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The Winnipeg Line of the Minnesota Division has completed its extension from Henning, Minn., north to Otter Tail.

MISSOURI, KANSAS & TEXAS.—A contract has been awarded to the Grigsby Construction Company for building the extension of this road from Georgetown, Texas, to Austin, 25 miles. The contract calls for the completion of the work on April 1, 1904. (Dec. 4, 1903, p. 878.)

NORTH & SOUTH ARKANSAS.—The proposed route of this railroad is from Smithville, Ark., through Ravenden and Ravenden Springs to the Missouri State line, 35 miles. Surveys are now in progress. Contracts for grading will be let in the spring. J. E. Polly, Ravenden Springs, is Chief Engineer, and M. H. Long, Imboden, Ark., is Secretary. (Dec. 18, 1903, p. 912.)

PETALUMA & SANTA ROSA (ELECTRIC).—It is stated that this company has purchased a large number of rails and that work will soon be begun. The road is projected from Petaluma, Cal., through Santa Rosa and Sebastopol to Forestville, 32 miles. A meeting of the stockholders will be held Feb. 9, to authorize a mortgage to the Mercantile Trust Company of San Francisco, securing an issue of \$1,000,000 of 5 per cent. 20-year gold bonds. E. H. Rollins & Sons, of Boston, have arranged to finance the road. J. A. McNear is President; W. F. Kelly, Vice-President, and Thomas Archer, Secretary. (July 10, 1903, p. 530.)

PHILADELPHIA & READING.—Press reports state that this company has practically completed the relaying of its main line from Philadelphia to Pottsville, Pa., with 90-lb. rails in place of the 80-lb. rails now in use. It is said that the Port Clinton yard will be relaid with 90-lb. rails. This will necessitate the changing of the switches and interlocking system at the yard. Work on this, however, has not yet been begun.

PHILADELPHIA, BALTIMORE & WASHINGTON.—Plans have been completed for a change of line between Principio, Md., and Oakington, 6½ miles. The work will include a new bridge 1,000 ft. long over the Susquehanna River from Havre de Grace, Md., to Perryville, and a viaduct on the Havre de Grace side about 900 ft. long.

QUEEN ANNE'S.—Press reports state that this company

is planning to extend its line from Hobbs, Md., southeast through Snow Hill and Salisbury, to a point near Chincoteague, 80 miles. The road runs between Queens, Md., and Lewes, Del., a distance of 60 miles. W. H. Bosley is President, and W. R. Crumpton is General Manager. (March 27, 1903, p. 240.)

ST. LOUIS BELT & TERMINAL.—This road has been completed from a connection with the C. & O. at St. Louis, to a connection with the Wabash, a distance of five miles. Work is now in progress from the latter point to a connection with the St. Louis & San Francisco, 11½ miles. B. E. Johnson, St. Louis, Mo., is Chief Engineer.

ST. LOUIS, BROWNSVILLE & MEXICO.—It is announced that this company will have its line in operation as far as Katherine, Texas, by April 1. This is about half way between Robstown and Brownsville, 141 miles, which is the projected route of the railroad. Grading has been completed for about 100 miles and track laid for a distance of 30 miles. F. G. Jonah, Corpus Christi, is Chief Engineer. (Jan. 1, p. 18.)

ST. LOUIS, KANSAS CITY & COLORADO (CHICAGO, ROCK ISLAND & PACIFIC).—It is reported that this company will build a branch from Cole Camp, Mo., north to Sedalia, 20 miles, paralleling the Sedalia, Warsaw & Southwestern between these points. Work is now in progress on an extension from Versailles, Mo., west to Cole Camp, 20 miles. W. L. Darling is Chief Engineer. (Dec. 18, 1903, p. 912.)

SAN PEDRO, LOS ANGELES & SALT LAKE.—Press reports state that this company has made a traffic agreement with the Atchison, Topeka & Santa Fe for the use of its tracks from Riverside, Cal., to Daggett. The S. P., L. A. & S. L. was recently opened for traffic between Los Angeles and Riverside, and grading is now in progress from Daggett northeast to Calientes, Nev. (Aug. 21, 1903, p. 610.)

SOUTHERN PACIFIC.—Chief Engineer Wm. Hood has furnished us with the following denial of the recent newspaper reports that sinks have again been occurring on the Ogden-Lucien cut-off. "The cut-off is nearing completion and no trouble whatever has been experienced during the past few weeks. No sinks have occurred, but the earth has settled here and there as it does in any new roadbed, and especially when a 'fill' is made in the water. We expected this to happen from time to time until the gravel and rock becomes settled."

SPARTANBURG & UNION.—A charter has been granted this company to build a railroad from Spartanburg, S. C., southeast to Union, 30 miles. Connection will be made with the Southern at both points, and with the Charleston & Western Carolina at Spartanburg. The names of incorporators are not stated.

SPRINGFIELD & PEORIA.—This company has been incorporated in Illinois to build a railroad from Springfield north through Sangamon, Menard, Mason and Tazewell Counties to Peoria, 50 miles. F. S. Peabody, A. W. Underwood, F. W. Upham, J. J. Hart and J. D. Adams, all of Chicago, are incorporators.

STRATHROY & WESTERN.—Application will be made at the next session of Parliament for an act incorporating a company to build a railroad from St. Thomas to a point on Lake Erie, with several branches. The company already has the right to build a line from St. Thomas, in a northerly direction to Park Hill. A subsidy for 31 miles of this line was granted at the last session of the Dominion Parliament. Royce & Henderson, Toronto, Ont., are interested.

TEMISKAMING & NORTHERN ONTARIO.—Surveys have been practically completed for the extension of this road from North Bay, Ont., to New Liskeard, 112 miles. Application will be made at the next session of the Ontario Legislature for the necessary power to begin the work.

TEXAS STATE R. R.—It is reported that this railroad, which runs west from Rusk, Texas, on the St. Louis Southwestern, into Cherokee County, will shortly be extended to Palestine, 18 miles. Connection will be made at the latter point with the International & Great Northern.

TOPEKA, FRANKFORT & NORTHWESTERN.—Surveys are reported in progress for this proposed railroad from Topeka, Kan., northwest to Waterville, 70 miles. It is stated that grading will be begun early in the spring. P. L. Wise is Chief Engineer. (Dec. 25, 1903, p. 930.)

TRIMBLE & HOCKING VALLEY.—Articles of incorporation have been filed by this company in Ohio. It is proposed to build from Orbiston south to Floodwood, five miles. This road will connect two branches of the Hocking Valley. L. G. Addison, C. W. Thompson, P. E. Morris and others, of Columbus, Ohio, are incorporators.

TRINITY & BRAZOS VALLEY.—Press reports state that as soon as this company has completed its line from Mexia, Texas, to Cleburne, 70 miles, it will build two extensions—one north to a connection with the Fort Worth & Rio Grande Division of the St. Louis & San Francisco at Granbury, and the other south to a connection with the projected Houston, Beaumont & Northern R. R. R. H. Baker, Austin, Texas, is General Manager. (Oct. 23, 1903, p. 768.)

TOLEDO, INDIANAPOLIS & SOUTHWESTERN.—This company has been incorporated to build a railroad from Toledo, Ohio, to Indianapolis, Ind., 190 miles. T. H. Tracey, H. W. Lloyd, G. D. Wells and others of Toledo are incorporators. The authorized capital of the company is \$200,000. S. D. Williams is the Chief Engineer.

TONOPAH R. R.—Contract for building this railroad from Rhodes, Nev., to Tonopah, 60 miles, has been awarded to McClain & McSweeney, of Tonopah. The contract calls for the completion of the work by June 1, 1904. Paul Eigelhart, Butler, Nev., is Chief Engineer. (Jan. 4, p. 18.)

UTAH.—The proposed route of this road is from Mile Post 470, on the Rio Grande Western in Colorado, to the State line between Colorado and Utah, near Evacuation Creek, 52 miles. Surveys have been completed and grading has been begun on the first 11 miles of the line. The Utah Construction Company are the contractors. The road will be narrow gauge. A. M. Johnson, Trenton, Colo., is Chief Engineer; C. O. Baxter, Denver, is General Manager.

VIRGINIA ROADS.—Surveys have been practically completed for an electric railroad from Richmond, Va., to Ashland, 17 miles. The road will parallel the Richmond, Fredericksburg & Potomac for about half the distance between these points. Track laying will probably be begun early in the spring. The Virginia Passenger & Power Company, of Richmond, is building the road.

WISCONSIN ROADS.—Press reports state that the Stearns Lumber Company will build a railroad from Odanah, Wis., west to Ashland, 10 miles. J. S. Stearns, Ashland, is President of the company.

WICHITA, ARKANSAS VALLEY & DENVER.—Contract is reported let for grading this proposed road from Pretty Prairie, Kan., northwest to Kinsey, 70 miles. Connection will be made with the Atchison, Topeka & Santa Fe at the latter point. The road is projected to extend eventually from Wichita, Kan., to Denver, Colo. F. M. Ceyes, Hutchinson, is interested. (Oct. 16, 1903, p. 730.)

WINDSOR, WALKERVILLE & CHATHAM (ELECTRIC).—Application will be made at the next session of the Ontario Legislature for an act incorporating a company to build an electric railroad from Windsor, Ont., east through Walkerville to Chatham, 50 miles, paralleling the Grand Trunk. J. H. Coburn, Walkerville, is interested.

GENERAL RAILROAD NEWS.

BALTIMORE & OHIO.—The Berlin Bourse has granted the application of this company to list its common and preferred stock. The Baltimore & Ohio and the Canadian Pacific are the only two American roads whose stocks are now quoted on the Berlin Bourse.

BRADFORD, BORDELL & KINZUA.—See Buffalo, Bradford & Kane below.

BUFFALO & SUSQUEHANNA.—This company has completed the purchase of lands in Indiana and Armstrong Counties, Pa., near Plumville, which contain more than 40,000,000 tons of coal. This property, together with the extensive coal lands already owned by the company, gives the Buffalo & Susquehanna possession of more than 110,000,000 tons of coal. Two extensions are now being built—one towards Buffalo, and the other into the heart of the company's coal lands. It is expected that these extensions will be practically completed by July 1, 1904.

BUFFALO, BRADFORD & KANE.—This company is the successor of the Bradford, Bordell & Kinzua, which was recently purchased under foreclosure sale by the Buffalo & Susquehanna interests. W. E. Olmstead is President.

BUFFALO, ROCHESTER & PITTSBURG.—This company has offered to shareholders an option to subscribe at par between Feb. 1 and Feb. 10, to the amount of 5 per cent. of their holdings, to \$700,000 additional common stock. This issue is the remainder of the \$3,000,000 of common stock authorized Nov. 27, 1901. The proceeds from the sale of the stock will be used to pay for 19 miles of road from Ernest, Pa., to Elder's Ridge, which is now practically completed. The company has outstanding \$6,000,000 preferred, and \$9,000,000 common stock.

CHICAGO, ROCK ISLAND & PACIFIC.—The special meeting of the stockholders of this company, which was called for Oct. 8, 1903, and postponed until Jan. 7, 1904, has again been adjourned without any action being taken on the proposed bond issue. The original plan was to make a mortgage of \$250,000,000. The following statement was published on Jan. 7: "The Board of Directors has for some time been giving careful consideration to the character of the new bonds which, under existing circumstances, it would seem desirable to issue for the purpose of refunding the obligations of the company and maintaining and protecting its strong position. A statement of the conclusions reached will shortly be laid before the stockholders."

NEW YORK CENTRAL & HUDSON RIVER.—This company has completed its purchase of real estate so as to make a straight cut through Marble Hill near Spuyten Duyvil, N. Y. The long curve at Kings Bridge will be eliminated and the distance saved will be about one mile. The amount paid for the land was reported to have been approximately \$1,500,000.

PINE BLUFF & WESTERN.—See St. Louis, Iron Mountain & Southern below.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—This company has bought the entire capital stock of the Pine Bluff & Western and has guaranteed its first mortgage bonds, both as to principal and interest. A mortgage was recently made with the American Central Trust Company of St. Louis as trustee, to secure \$1,200,000 of 5 per cent. gold bonds. The road runs from Pine Bluff, Ark., to Benton, 42 miles, and is now operated as a division of the St. Louis, Iron Mountain & Southern. The report in our issue of Dec. 25 that this company was sold to the Chicago, Rock Island & Pacific was incorrect.

SEABOARD AIR LINE.—A circular has been sent to the stockholders of this company stating that opportunity will be offered to subscribe at par to the extent of 10 per cent. of their holdings to an issue of \$5,000,000 of 5 per cent. collateral general lien trust bonds, due March 1, 1907, subject to call at par at the company's option. With each \$1,000 bond will be given a bonus of \$900 preferred shares and \$1,600 common shares, both represented by voting trust certificates. Blair & Co., T. F. Ryan and T. J. Coolidge, Jr., have agreed to organize a syndicate to underwrite the issue, with the Continental Trust Company as trustee. Of this issue, half will be used to complete the Birmingham extension, and the remainder to take up \$2,500,000 collateral notes, due June 1, 1904.

SOUTHERN.—A mortgage has been filed by this company with the Central Trust Company of New York, securing the recent purchase of the Knoxville & Ohio and the Knoxville & Bristol railroads. The amount of the mortgage is not specified. The bids conveying the properties to the Southern specify the sums of \$1,227,980 in the case of the Knoxville & Ohio, and \$82,000 in the case of the Knoxville & Bristol.

This company has acquired the Tennessee Northern, which runs from La Follette Junction, Tenn., to La Follette, 10 miles. The road will be operated as the Knoxville Division of the Southern.

TENNESSEE NORTHERN.—See Southern above.

VERA CRUZ & PACIFIC.—The United States Circuit Court has authorized Allen McLean, the receiver of the Maryland Trust Co., to borrow \$2,000,000 on the securities of the Vera Cruz & Pacific to complete its construction and equipment, and to provide against a lack of earnings due to heavy operating expenses pending the completion of the road.

WESTERN MARYLAND.—The syndicate formed to underwrite this company's first mortgage 50-year 4 per cent. bonds, which expired by limitation on Jan. 1, has been extended to July 1. The syndicate took \$25,000,000 of the first mortgage 4 per cent. gold bonds. Little effort has been made, however, to dispose of these bonds, as it is understood that the syndicate desires to have the through line connecting with the Wabash completed before a public offering is made.